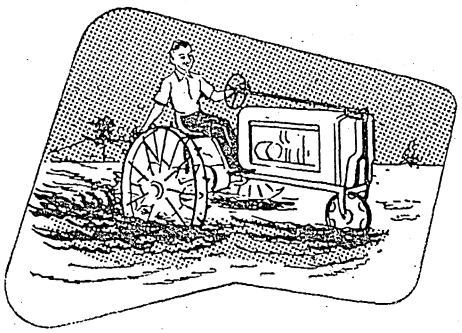
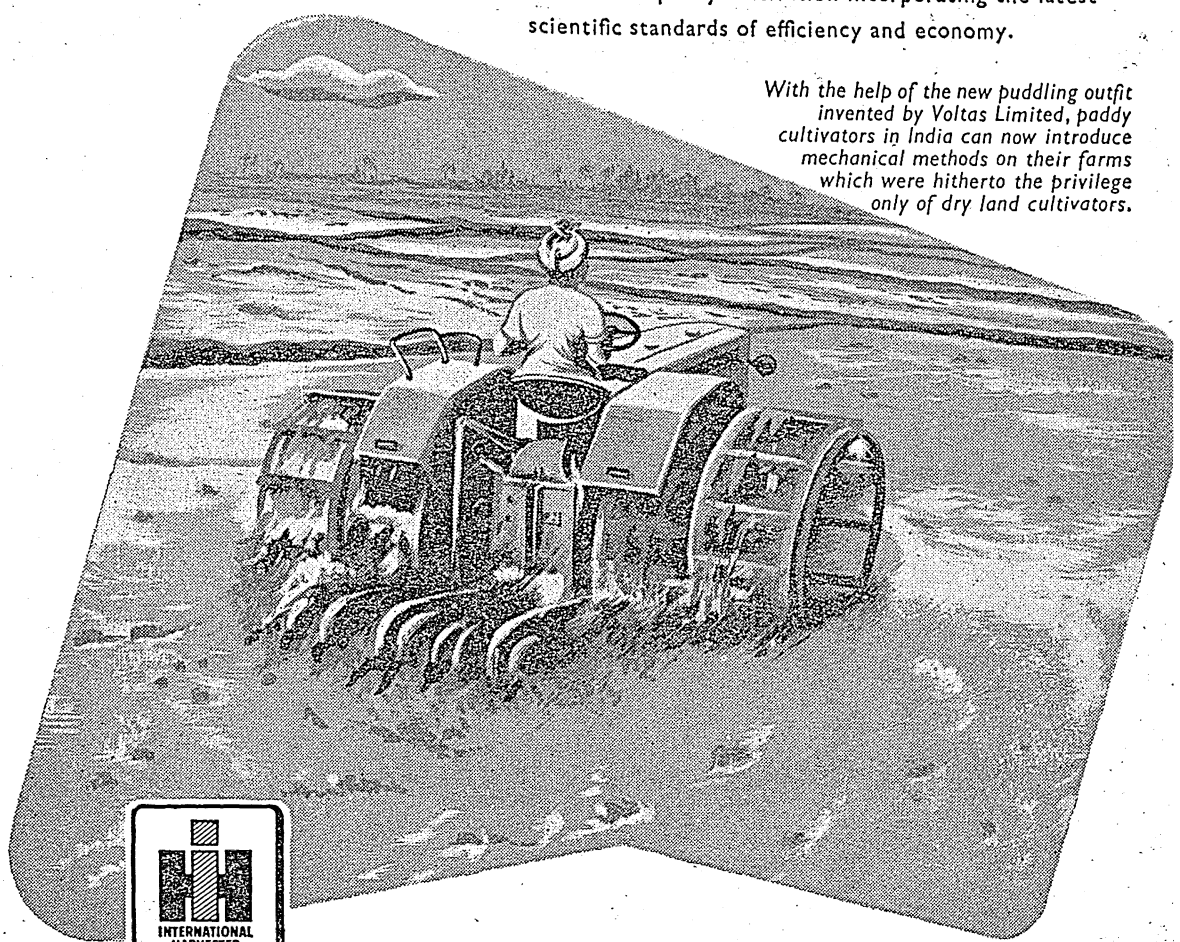
Milestones in Mechanised Agriculture—IV



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OUR COVER

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Photo : H.K. Gorkha

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NEW DELHI

BETTER COTTON ACRES

RESEARCH is yielding still newer results for application in the field and is helping us raise our cotton yields.

ALREADY, improved varieties bred and released throughout our cotton areas have enabled farmers to obtain better harvests, bringing them in 1955-56 alone an additional income of 13.6 crores of rupees due to their superior quality and high yield.

TODAY, 72 per cent of the total cotton area of the country, or, 14.3 million acres of the total of 19.8 million acres under cotton, is being sown to these improved varieties.

BUT, improved varieties are not all. The per-acre yield has further to be increased. Such findings as advancing the date of sowing in certain tracts to get an extra yield of up to 200 pounds an acre with certain varieties deserve to be adopted on a large number of farms.

THE use of plant hormones, costing about four rupees for an acre, has been found in certain areas to result in an additional yield of 116 pounds of seed cotton per acre, thus opening another excellent and cheap way to getting more cotton.

WILT-RESISTING varieties evolved have provided a way out of the losses due to the wilt disease found in many regions. In the case of the 'anthracnose' disease, seed-treatment with mercurial fungicides has been found successful, and is being tried on thousands of acres in Bombay State. Direct and indirect methods of controlling the insect pests of cotton such as the spotted bollworm and the pink bollworm, which bring down cotton production, have been found, and these findings will now benefit hundreds of thousands of cotton farmers.

THE Central and State Governments have done, and are doing, much work in popularizing these new research findings in our cotton areas. It is the cotton farming community that has now to co-operate to a fuller extent in this work so that the fruit of research is fully utilized by it on the farms.

UNTIL then will remain farms producing just about a 100 pounds of cotton under rain-fed conditions —one of the lowest of the world's cotton yields.

LANCING FOR LATEX

PAPAIN is prepared from latex from green papaya fruits, and the latex is obtained by "lancing" (tapping) the fruits; lancing is continued till the fruits are almost ripe.

In experiments at Saharanpur, it was found that the highest yields of latex and papain were obtained by starting lancing when the fruit was two months old.

However, 2½-month old fruits gave a higher yield of latex and crude papain at the first lancing than two-month old ones. Thus, the cost of tapping could be reduced by tapping fruits of the 2½-month age group.

Lancing did not reduce the fruit size.

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Farmers I Have Met

the makings of a better farmer



Jarnail Singh

Looking up !

A NAME quite familiar to the farming community around Mananwala—a village four miles from Amritsar, is that of Jarnail Singh of this village. Hardly out of his twenties, Jarnail handled a plough for the first time just three years ago, but later saw to it that his 58-acre farm stood out as one "above the ordinary." That he is well on the way to his goal would be evident from just one instance : the way he raises his paddy.

In paddy, Jarnail gives "special" attention to the nursery. "One really sturdy seedling produced can do the work of four 'weeklings' in the matter of yield," he believes.

This is what he does. Uses seed sparingly—only two seers for a *marla* (about 25 square yards) of the nursery. (In this way, he also cuts on his seed costs). Properly covers the seed with farmyard manure after broadcasting it. Irrigates. When the seedlings have grown five to six inches, applies ammonium sulphate. (Now, he is trying urea as a substitute for ammonium sulphate. He had applied it to his *ajwain* crop to watch its effect).

Since the seedlings thus produced are very vigorous he plants only one seedling at a place, keeping the distance from plant to plant as well as row to row, four inches.

The crop receives ammonium sulphate at a maund per acre.

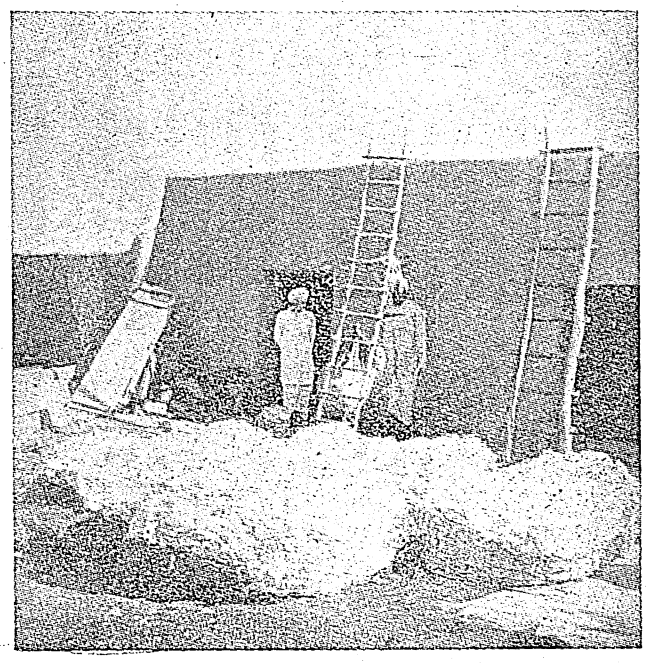
No pest or disease has bothered his crop so far.

Yield : average 20 maunds to the acre.

Jarnail fully understands the importance of improved varieties. "In fact, to get the best out of them you must cultivate them in the proper way," he says.

He uses *Basmati* and *Jhona 349*—two improved varieties recommended by the Punjab Agriculture Department.

The ladder makes a convenient beam for weighing the cotton



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The cauliflower crop was temptingly good

Of course, Jarnail's farming does not end with paddy. Wheat perhaps accounts for the largest area on his farm—30 acres. Here again, he averages 20 maunds to the acre. *Methods* : wheat-fallow-wheat rotation, improved *C. 591* seed at 30 seers per acre, ammonium sulphate at a maund per acre and seed-treatment to avoid Ear Cockle.

Jarnail is also a successful cotton-grower. He broadcasts his crop—later on thinning it, and also sows it in lines with drill. Broadcasting is mainly resorted to save time when his attention is required elsewhere.

For an early and better germination, he water-soaks his seed for four hours before sowing and, to save the crop from jassids, sprays DDT—ten per cent "Agroside" mixture. He grows *320 F* and the local *desi*, but is currently giving a trial to *231 R* which is reputed to yield more, with more lint and a high ginning percentage. It has given him a calculated yield of 20 maunds per acre on his experimental plot.

Jarnail has set apart a sizable plot on his farm for vegetables. At the time of my visit, milk-white cauliflowers ruled the roast on this plot, though carrots, radishes and turnips were also very much in evidence. It pleased me when Jarnail told me that he was now trying to raise carrots in the way another farmer, Faquir Mohammad of Malerkotla in the Punjab, was doing it.

About Faquir Mohammad's achievement, he told me, he had come to know through *Indian Farming*, and was simply fascinated by the three-foot long, excellent-quality carrots raised by him.

—Harkirat Singh

Get Nutrition By 'Growing' Nutrition

"A farmer who does not raise an 'egg crop' on his farm raises only food and no nutrition," says Kak

by

M. G. Kamath



"FARMERS should think of 'growing' nutrition and not just food on the farms," is the faith of a farmer in Rajasthan. He has been demonstrating on his farm how this is done.

The farmer is Vijayendra Narayan Kak (Ramji Kak to all who know him) and the farm "Vasundhara", about four miles from Jaipur City.

What the farmer means, to quote his words, is: "If you grow cereals or pulses or other food crops, you do get food but not enough nutrition. So, to supplement this, you have to 'grow' eggs, milk and honey, in addition to fruits and vegetables. The emphasis will then shift from quantity to quality."

"Vasundhara" is a 27-acre farm. A section of it grows irrigated crops, water being pumped from the wells; another section is devoted to the orchard; the third section is devoted to dairying; a fourth to poultry. Beehives have no particular section, but are found here and there, and all over.

But, Ramji Kak has given something to "Vasundhara" that other farms lack. It has been planned aesthetically. When you visit the farm, you feel you are visiting a park, because in front of the neat farm-cottage is a beautifully-laid floral garden, shrubs and trees with a small pond in which many coloured fishes move their fins.

You would be surprised when you are told that all this has been converted from a sand dune overgrown with *moonj* and an occasional *babul* on it in 1949—the year Kak wanted to try his "growing nutrition" idea.

Langra
has a place of pride on "Vasundhara"



Instead of *moonj*, you now find wheat grown, yielding an average of 42 maunds of grain to the acre. Ramji grows *C.591*, and gets this 1½ times the normal yield by applying ammonium sulphate and superphosphate (4:1) in addition to carefully tending the crop.

SKY-HIGH CROPS

Whether it is wheat, *jowar* or *bajra*, Ramji's ambition is to get sky-high crops. Whatever the crop, he believes in a good basal dressing of compost. For this purpose, he has six compost pits in which he turns compost in and out.

Where there was once *babul*, there now is an orchard of mango, guava, *aonla*, *karonda*, papaya, citrus and, yes, jackfruit—the nutritious fruit. The *Langra* and *Banarasi* mangoes from the orchard were declared the best at the State Mango Competition held recently. A straight strip of nursery at present has 36 varieties of mangoes for planting out in the orchard later.

The egg crop on the farm is Kak's favourite "nutrition" crop. White Leghorns and Rhode Island Reds receive special attention from him and in return give a high egg-yield, some of the birds giving as many as 170 to 180 eggs per year.

Some of the rules to get such a fine egg crop will be of interest to many who would do well to adopt the same.

NO DISEASE NO LOSS

The first rule in "Vasundhara" is the "no disease no loss" rule. So, he segregates all new arrivals for three to four weeks. All the 100 birds that he has get a DDT dusting periodically. Poultry cages get a blow-lamp fire once every two months to kill all parasites. The perches in the cages are tick-proof. When birds are young, they get a routine vaccination against Ranikhet. And the dust-bath that is provided has a little of tobacco powder and sulphur.

Ramji has provided sufficient space for him to move the portable poultry houses, shift them from field to field, thus enriching each field in turn with the birds' droppings.

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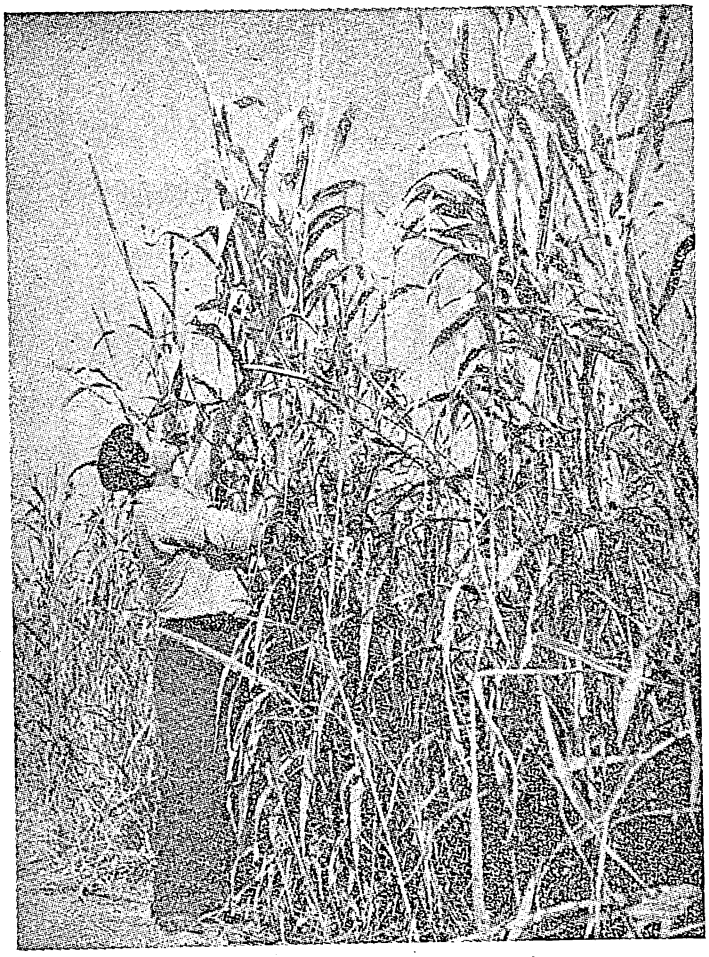
three sources of nutrition on the Kak farm—

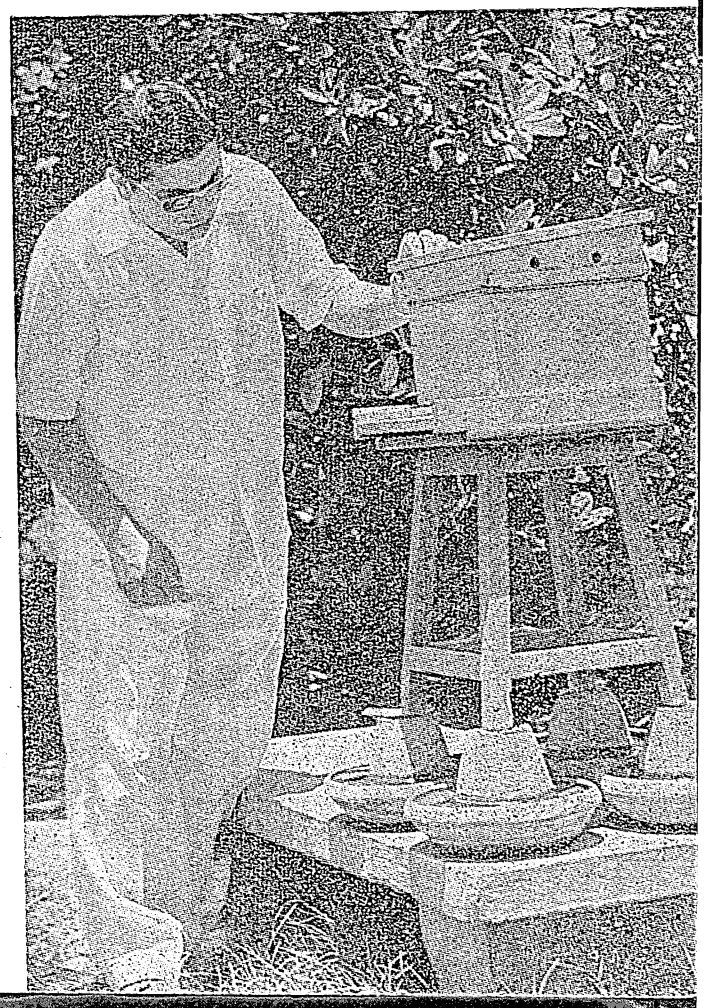
(*top*) feeding time for poultry on the farm ;

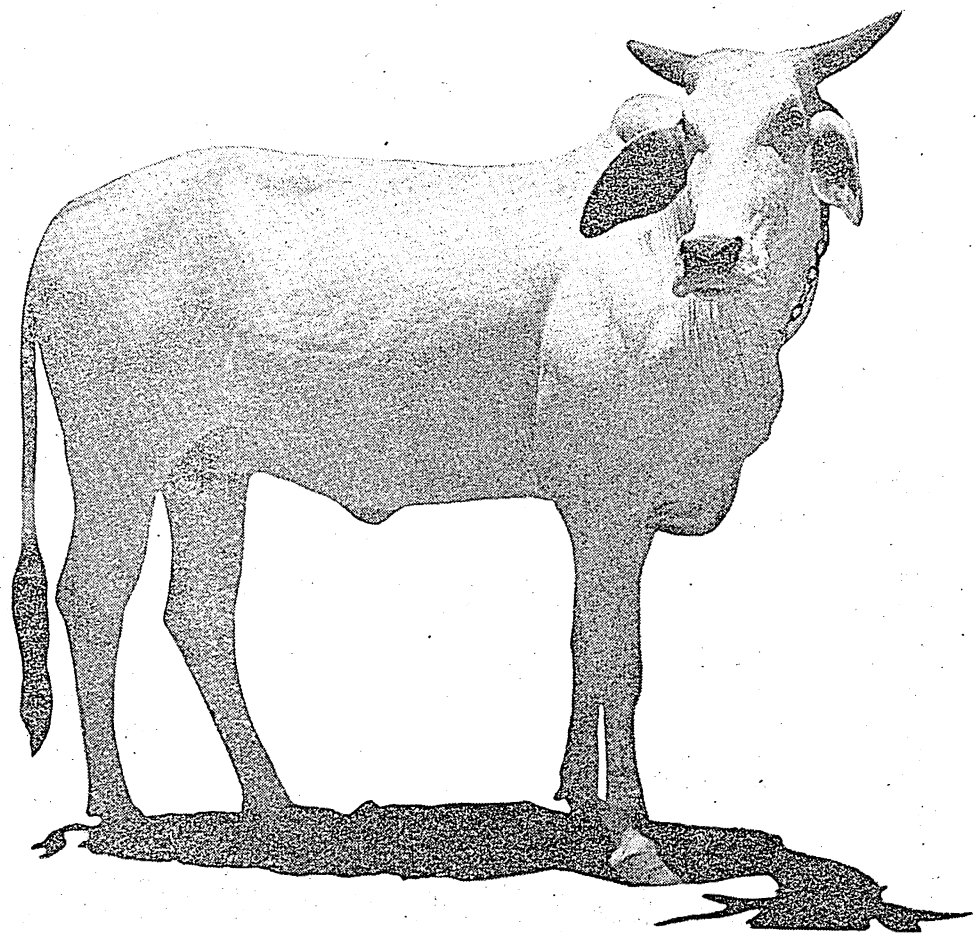
(*below, left*) a ten-foot-six-inch millet crop raised by Ramji Kak ;

(*below, right*) the bees on the farm, besides providing nutritious honey, are a great aid in increasing crop-yields









One of the Hariana heifers bred on the farm
(Photos by H. K. Gorkha)

The birds are well-fed. They get a mixture of *jowar*, *bajra* and maize in the morning, chopped grains at noon and a mash containing gram, wheat bran, meat offal (except in the summer months) in the evening.

And with this feed and care the birds cannot but lay well.

DAIRY HERD

"Vasundhara's" dairy herd consists of seven Hariana cows, each averaging ten seers of milk a day. He maintained a Hariana bull till recently for breeding.

The cows are treated to a good feeding apart from the care given in breeding. They get a grain feed, wheat, barley and *guara*, depending upon the availability, "churnmeal", green fodder, carrots when available, dry *ber* leaves, and wheat bran and cotton seed and oilcake.

Even the goats on the farm yield well. Ramji owns a few Jamnapari goats with a daily milk-yield average of five seers.

The bees on the farm are kept busy because of the variety of forage available. The farmer thinks that one cannot ignore the bees. Apart from producing the nutritious honey they help increase the yields of crops by helping pollination.

Ramji is one of the sponsors of the State Ram Breeders' Association. He now wants to organize a cattle breeders' association too. "These associations," he explained, "are needed to improve the sheep and cattle so important to the economy of Rajasthan farming."

Visitors to "Vasundhara" carry away the "growing nutrition" idea of Ramji Kak with them. The farmer hopes to convert all to this idea some day. Looking at the seriousness with which he goes about his farm work, I am sure he will.

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The *Arjun* Stands Sentinel on River Banks

by

M. D. Chaturvedi

A LARGE, handsome and near-evergreen tree, the *arjun* has a wide crown-spread and drooping branchlets. It frequents watercourses throughout the Deccan and the sub-Himalayan tracts, and often attains enormous dimensions on alluvial soils with the water-table fairly high. McDonnel records a girth of 26 and 32 feet of two trees, at five feet above the ground level, at Jammu. The bole is smooth, and with advancing age tends to develop buttresses for support.

The *arjun* is known by a variety of names: *arjun, arjuna, kahua, koha*, Hindi ; *savimadat*, Marathi ; *holematti*, Kannada ; *kula marutha*, Tamil ; *thella maddi*, Telugu. In Latin, it is called by the name of *Terminalia arjuna*.

The *arjun* is near-evergreen, with a very short leafless period. Early in April, its crown is clothed with a gorgeous foliage and bunches of small, white flowers. The fruits with five raised ribs appear from January onwards. The tree begins to fruit and flower quite early.

PROPAGATION

The *arjun* prospers well in alluvial soils along watercourses with the underground water level close at hand. Its shallow root system prevents its establishment in dry localities.

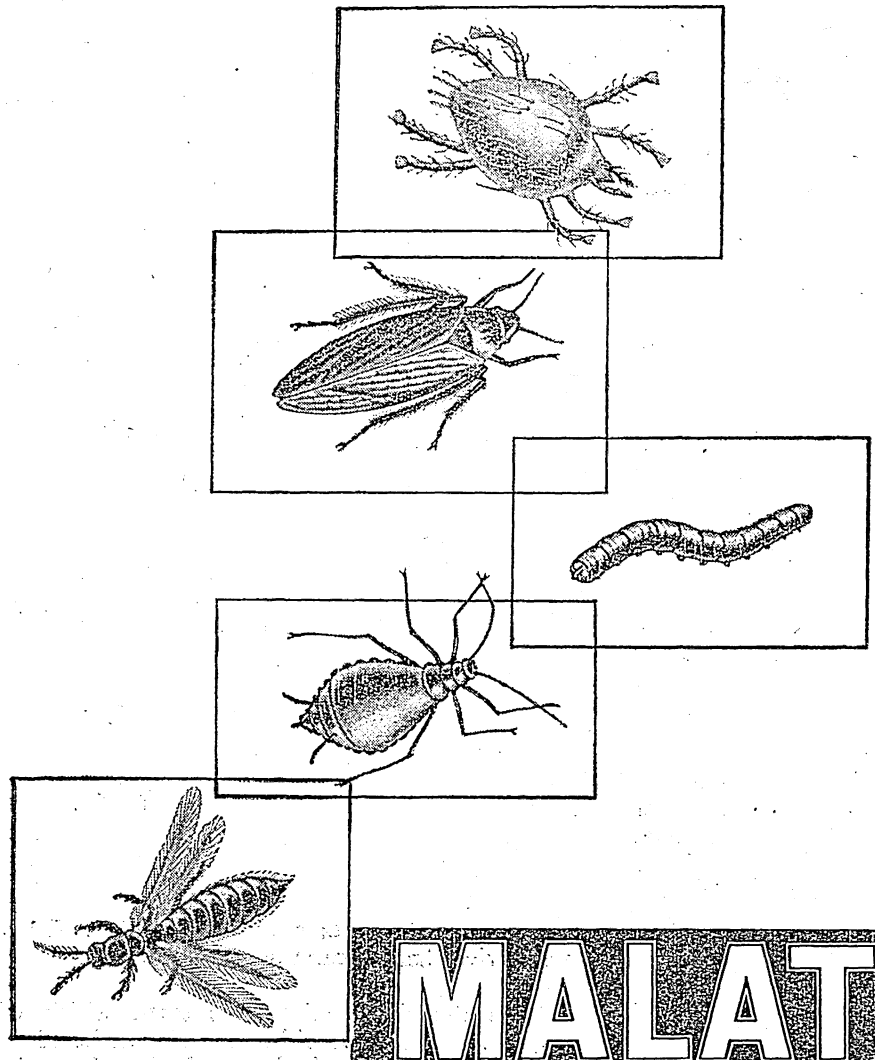
Fruits dispersed naturally germinate at the break of the monsoon. Young seedlings develop well under the shade of the mother tree. Side-shade is beneficial in the early stages of their development. Seedlings raised in nurseries stand transplanting fairly well. Seeds sown in April and irrigated in nurseries give large enough plants for transplanting at the break of the monsoon. Transplants should be frequently weeded and watered. A loosening of the soil all round the young plant helps in conserving moisture.

Young seedlings suffer frightfully from frost. It is for this reason that they prosper best where the side-shade of the mother trees is available. The *arjun*, a tree of river banks, cannot stand drought at all.

It is the finest of avenue trees, which with its gorgeous foliage provides a welcome shade during summer. The wood is used in house-building and in the making of agricultural implements, boats and carts. The bark yields valuable tannin.



The *Arjun* at its best along Teen Murti Road, New Delhi



MALATHION

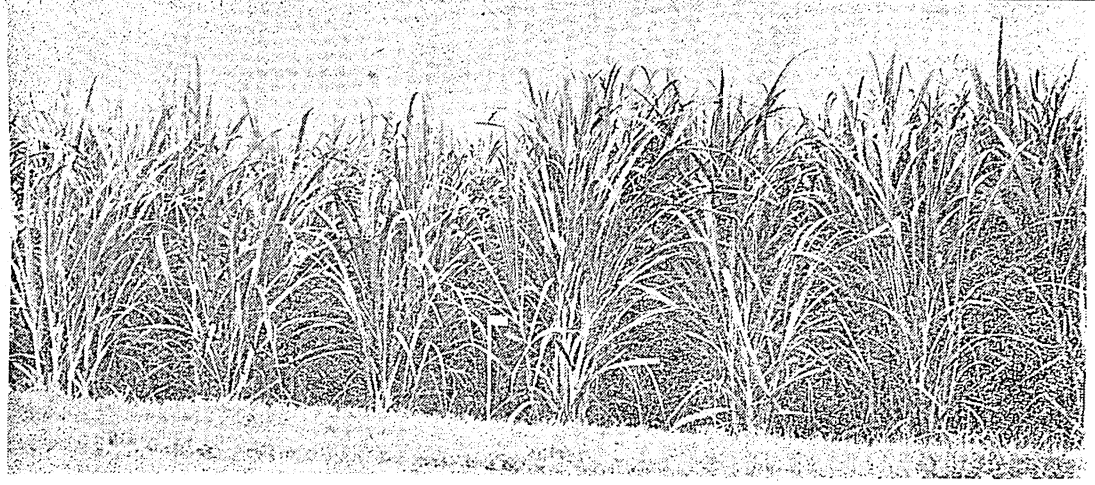
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A 3½-month old sugarcane crop at the Anakapalli Research Station. The three rows on the left are on the untreated plot and those on the right on the 'Endrin'-sprayed one

'Endrin' and your shoot borer problem

by

C. Ramachandrachari and

N. V. Mohan Rao

Sugarcane Research Station, Anakapalli

STUDIES made at the Sugarcane Research Station, Anakapalli (Andhra Pradesh), show that the 'early shoot borer' damage can very well be ontrolled by spraying 'Endrin' on the sugarcane crop.

In all important cane-growing centres of Andhra Pradesh, dead-hearts are commonly met with. These are caused by the early shoot borer. Whenever there is borer trouble, several shoots die off in the early stages of the sugarcane crop. As a result, there is a loss in yield of cane and sugar. Of course, in borer-infested clumps there is an induced tiller activity making up for the loss of tillers to some extent. All the same, at harvest the borer-infested clumps weigh less as compared to borer-free clumps.

The loss in yield due to the borer attack can be estimated at about 20 per cent. Hence, the need to tackle the borer problem.

At the Research Station, trials in controlling the borer with chemicals were started as early as 1951. DDT and BHC were taken up first. Later, several other insecticides like 'Toxaphene', 'Parathixon', 'Aldrin', 'Endrin' and 'Ryania' were also tested. Of these, 'Endrin' and DDT gave better results.

In 1956-57, the comparative efficacy of DDT and 'Endrin' was studied in detail. Three sprayings with each of these were taken up during the fourth, fifth and ninth week of age of the crop. Forty gallons of the spray fluid per acre were used for the first spraying, 60 for the second and 80 for the third. Observations on egg deposition by the insect, emergence of shoots, extent of damage caused to them by the borer during early stages of the crop, juice quality and number and yield of cane at harvesting were recorded in each treatment.

The results obtained are given in the Table below.

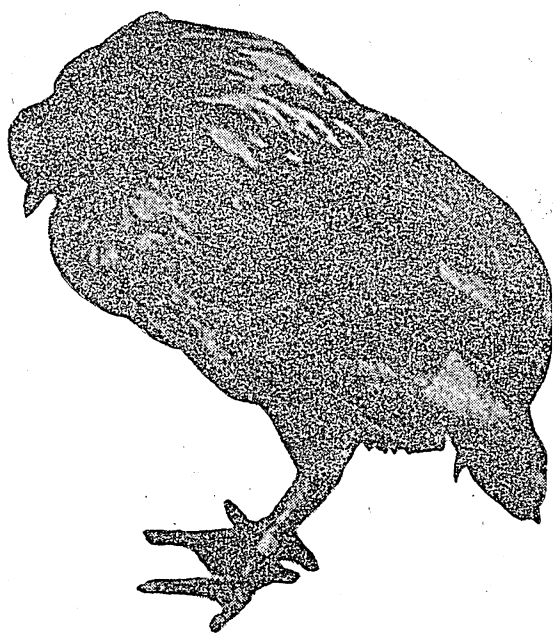
It will be seen that when 'Endrin' was sprayed, the borer infestation was only three per cent, and with DDT 5.1 per cent. Looking at the results, it is clear that 'Endrin' is superior to DDT for controlling the borer.

(Continued on page 16)

Treatment	*Percentage of borer infestation during the first four months of age of the crop*	*Yield of cane in tons per acre*	*Extra yield of cane in tons per acre over the control*	*Value of the extra yield at Rs. 39-2 per ton of cane*	*Total cost of spraying the insecticides per acre including labour charges*	*Net profit per acre*
				Rs. a.	Rs. a.	Rs. a.
'Endrin' 0.02 per cent spray	3.0	48.06	7.66	299 11	20 6	279 5
DDT 0.32 per cent spray	5.1	46.90	6.50	254 5	34 2	220 3
Control (no treatment)	19.4	40.40	—	—	—	—

The cost per pound of 50 per cent DDT water dispersable powder, taken at Rs. 2-6, and of 'Endrin' 19.5 per cent emulsifiable concentrate, at Rs. 6-8

HOW TO FIGHT TICK-FEVER IN FOWLS



A typical tick-fever case

by **S. B .V. Rao**

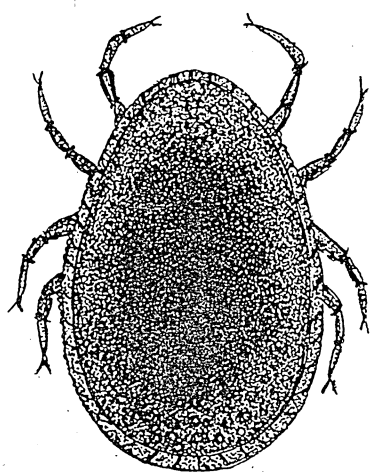
Poultry Research Division
Indian Veterinary Research Institute
Izatnagar

EVERY year, poultry losses occur, especially in north and central India, due to tick-fever.

Called *Spirochaetosis*, tick-fever is caused by a germ spread by the common fowl-tick.

Apart from chickens, ducks, geese and turkeys among the domesticated birds also get the disease.

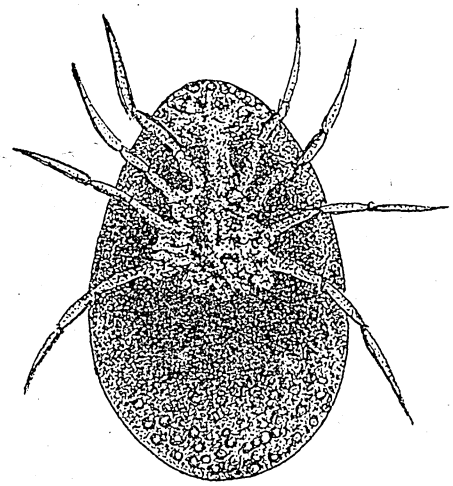
Ticks have been found to take shelter under the bark of some trees on which birds of prey, like the vulture, roost. It is likely that such birds keep the disease going between them and the ticks, and then pass the ticks into poultry farms where they infest poultry yards and brooder houses. The disease-producing germ spends a part of its life in the tick, but the disease may pass on from bird to bird without the help of the tick. The germ is found in the egg, larva and nymph of the tick.



An adult fowl-tick (*Argas persicus*)

All ticks may not carry the germ, but when they attack a bird in large numbers it loses a lot of blood and becomes so weak that it is unable to stand on its legs and dies in a couple of days.

The larvae or the young ones of the ticks stick to the skin of the fowls for a few days, sucking their blood before falling off. They can be seen as tiny blue specks under the wings, breast and such other parts of the body covered by feathers. This stage is commonly noticed during the monsoon and pre-monsoon season (May to September) when the weather is hot and humid. This also is the peak season for tick-fever, which may continue up to October when the ticks go underground for their winter sleep.



. . . as it would look when lying on its back

NIGHT FEEDER

The adult tick is a night feeder and hides in cracks and crevices during daytime.

The germs produce a high temperature in the fowl which comes down after some time. Mortality in birds varies from 25 to a 100 per cent, depending on the severity of the attack.

Birds having tick-fever are drowsy and assume a vulture-like posture with the neck drawn in and feathers ruffled. Forty-eight to 72 hours after this condition, many birds give out plenty of green and watery evacuations. Some birds are paralysed on their feet; others which linger on still after the temperature has come down show a loss of flesh.

When birds dead of the disease are opened up, the spleen will be seen to have been much enlarged.

QUICK ACTION

As deaths due to the disease occur fast, quick and effective action should be taken to control it. Naturally, the veterinarian's help must be sought immediately. He will be able to vaccinate the young stock so that they may be protected against the disease. He will also be able to treat the sick birds.

To control the disease, naturally the ticks must be controlled. Spraying water-soluble DDT in poultry houses and brooders periodically will be helpful in keeping ticks out.

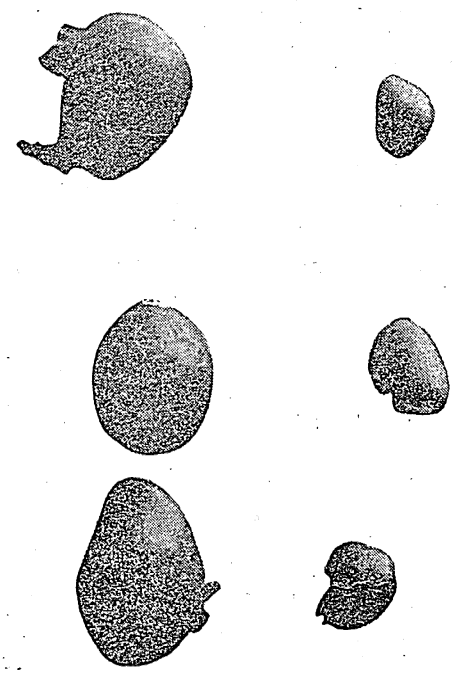
Ticks can be prevented from multiplying by using angle-iron fowl houses resting on brick and cement bases, with an asbestos gable supported by angle-iron posts fixed in the base so that the roof is some four feet above the top of the fowl house. 'Gurdaspur perches' may also be used. These are perches mounted on beer bottles which form the supports in place of wooden legs. The ticks will slide off the sides and would not be able to get to the fowls.

It would be a good practice to burn dry pastures during the tick season and before the monsoon rains start. This will help keep insect life down.

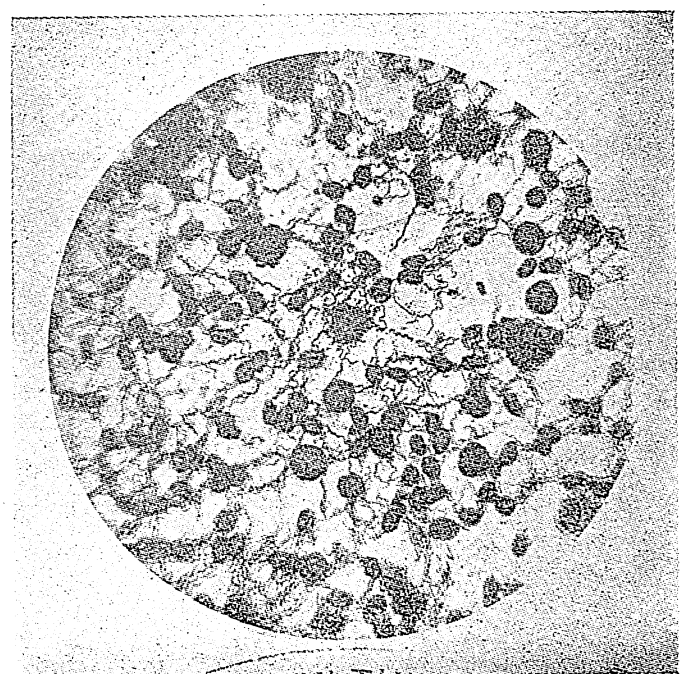
Another good precaution would be to provide dust-baths and dusting powders containing DDT in ash in chicken pens.

Providing overhead nets will prevent wild birds from having access into the poultry runs. Similarly, water, mash and grain fed to chickens in the yards should be protected from contamination by wild birds.

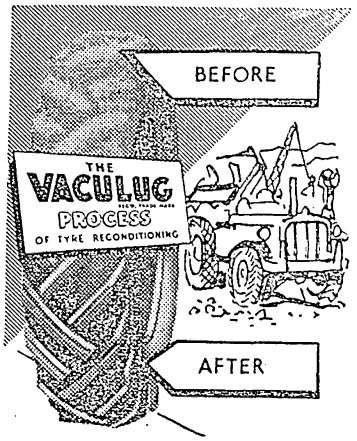
Fowl spleens enlarged due to tick-fever (*left*). Compare them with normal spleens on the right



Tick-fever germs in the blood of a chicken as seen under a microscope



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Making Short Work of Lantana

by

T. R. Narayanan and N. M. Thyagarajan
Agricultural College and Research Institute, Coimbatore

A NEW chemical weedicide has come to the rescue of those who wish to get rid of the bad woody weed, Lantana.

Lantana (*Lantana camara*), known as *unni chedi* in Tamil and *arippoo* in Malayalam, is quite a problem in many areas. This perennial shrub, introduced some years back from Tropical America as an ornamental plant, has now run wild at all elevations of up to 6,000 feet on the Western Ghats. Growing to a height of four to six feet, the plant multiplies both by seed as well as by root suckers and becomes a pest in no time, making its destruction a real problem.

In previous years, swabbing the cut-off butts of Lantana or spraying the regrowth after brushing with arsenic was found successful in getting rid of this weed. Hormone weed-killers are now found to be more effective and, being non-poisonous to animals and human beings and also non-corrosive, these weed-killers can now be preferred to arsenic under all conditions.

Experiments with the new weed-killers were carried out last year at the Agricultural Research Station, Ambalavayal, and the Fruit Research Station, Kallar. The work was carried out under a scheme financed by the Indian Council of Agricultural Research.

In these experiments, 2,4,5-T and brush-killer were the weedicides tried. Each of these was used at ten and 20 pounds per acre. In one set of experiments, the weedicides were applied to the plants as such, and in another they were applied to the plants pruned to a height of two feet from the ground.

The spray volume used in all the cases was 150 gallons per acre. A wetting agent, 'Teepol', was added at five cubic centimetres per litre of the spray liquid. Spraying was done in a fine warm weather. The effects of the different treatments were noticed a fortnight after this spraying and again two months after spraying.

Observations at both the Research Stations were similar. All the treatments were effective in scorching the tender shoots of Lantana within a fortnight. The hard twigs, however, were only slightly affected. The maximum effect was obtained with 2,4,5-T at 20 pounds per acre. The weedicides were more effective when applied after pruning the plants.

Experiments showed that 2,4,5-T, when applied to Lantana pruned to a height of two feet from the ground at 20 pounds per acre, gave the best results. The plants dried up completely in 15 days. This, therefore, seems to be the best method for farmers to follow in eradicating the Lantana weed.

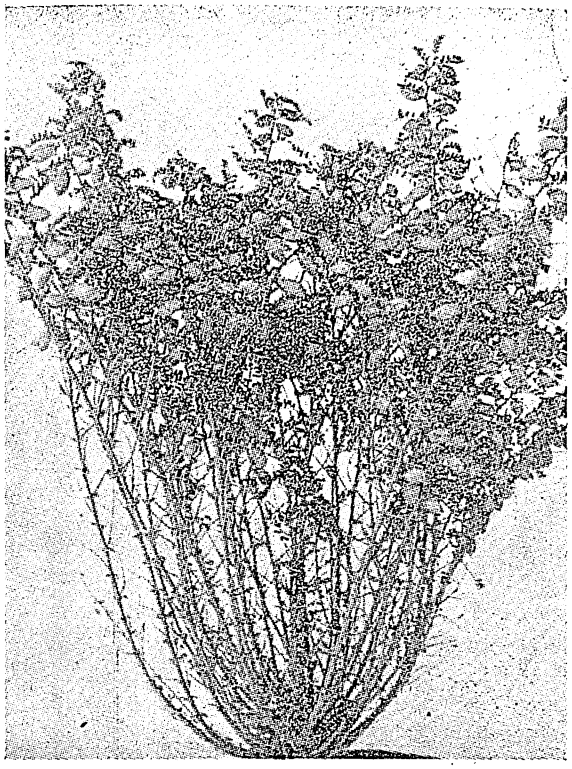
A New Gram and a New Arhar for U.P. Farmers

by

Dharampal Singh

and

J.M. Sahai



Gram Type 1—**a good spread and plenty of pods**

RESEARCH in Uttar Pradesh has succeeded in evolving a new variety of gram. This variety combines early maturity and bold size with a high-yielding capacity.

The variety has been named *Type 1*, and is being distributed to farmers in the Bundelkhand area for which it has been found to be the most suitable.

Gram is an important crop of Uttar Pradesh. A third of the total area under gram in India is found in this State, which accounts for 37 per cent of the gram produced in the whole country.

In the Bundelkhand area of the State, bold-seeded early-maturing varieties of gram are grown. The local variety here, grown over a large area, goes by the name of *Banda* gram.

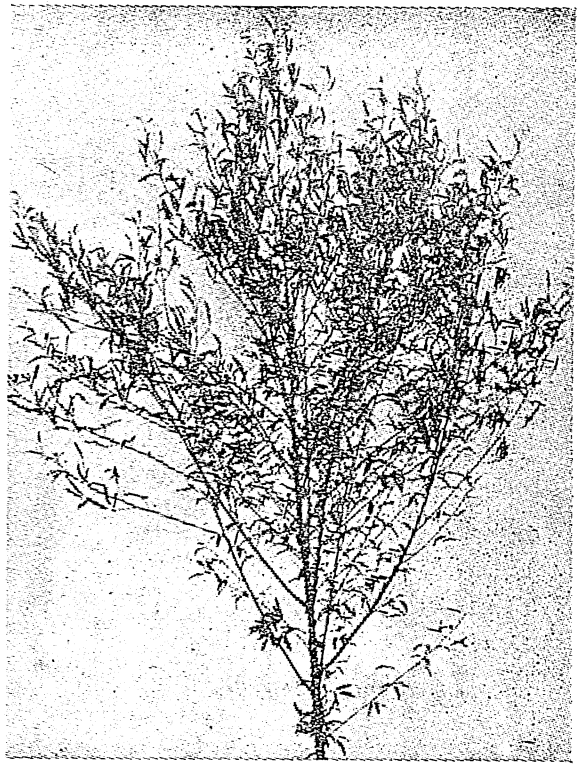
Good as these qualities were in gram, they needed one more character—the high-yielding ability found in other varieties.

To bring these characters together, crosses were made between several promising parents. One cross was between the *Banda* gram and *Type 87*, the recommended variety in the area. One of the hybrids was finally found to be the best, having early maturity, bold seed and high yield. This is the one now christened *Type 1*.

Type 1 has a spreading habit. It flowers in 54 to 58 days, which is a week earlier than *Banda* and two weeks earlier than *Type 87*. It matures in 145 to 150 days, and even earlier under the drier conditions of Bundelkhand.

The new variety has bold, plump seeds of a brown colour. The average yield is over 18 maunds per acre, going up to 30 maunds under good conditions.

Arhar Type 105—**tall and spreading**



In various places in Uttar Pradesh, the *Type 1* gram has fared well in trials, especially in the Bundelkhand region, where it gave higher yields than *Banda* and *Type 87*.

NEW *ARHAR*

Similar has been the success in evolving a variety of *arhar* (*Cajanus cajan*) in the State. This *arhar* has for its qualities high yield, wilt-resistance and good cooking quality.

Work has been going on in the State since 1932 to evolve improved varieties of *arhar*. Earlier attempts had resulted in producing *Type 66* and then *T.17*. *Type 66*, however, had the handicap of uneven maturity and poor cooking quality. It was also susceptible to wilt. *T.17*, which replaced it on farms, was comparatively more resistant to wilt, had better cooking quality, but did not compete with the local varieties in the matter of yield.

The search for a better variety was, therefore, continued. Now, *Type 105* is the new variety evolved ; it has all the desirable characters plus high yield.

Type 105 is a tall, spreading variety. It is late-maturing, taking eight to 8½ months to mature. When sown in the first week of July (with the advent of rains) it takes 140 days to flower.

The flower colour is yellow, with light red streaks and the green-pod colour is green with dark streaks. The seed (three to four in a pod) is medium in size, brown in colour.

The new variety yields 18 to 22 maunds to the acre on an average. Besides the high yield, *Type 105* is about ten days earlier in maturity and has a bolder seed than *Type 17*.

Tested extensively on Government Farms, *Type 105* has outyielded both *Type 17* and the local varieties. It also showed a wider adaptability.

The new variety will be suitable for Bundelkhand and central and western Uttar Pradesh, especially the Bundelkhand area.

'ENDRIN' AND YOUR SHOOT BORER PROBLEM

(Continued from page 11)

The studies so far made with spraying 'Endrin', 0.02 per cent dilution, at an ounce (an ounce of 19.5 per cent emulsifiable concentrate) show that the sprayed plots gave an extra yield of cane from 7.1 to 8.2 tons per acre. With hand-operated sprayers, the cost of three sprayings with 'Endrin' worked out to only about Rs. 20 per acre.

It is, therefore, clear that the borer damage to sugarcane can be controlled effectively with 'Endrin', and this operation deserves to be adopted by farmers as a regular item in sugarcane cultivation.

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WHAT'S NEW IN FARMING

A NEW COTTON VARIETY

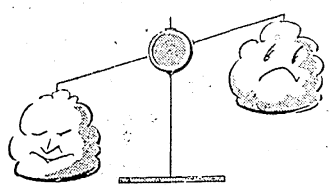
A NEW improved cotton variety is being recommended for growing in Uttar Pradesh.

Named *35/1*, the variety has been found to give an extra income of Rs. 34 per acre over *C. 520*, the variety introduced into the State earlier.

On farmers' fields, *35/1* has given better yields than any other strain—an average of 714 pounds of *kapas* and 264 pounds of lint per acre. Its staple length in the 32nd inch is 26, ginning percentage 37 and spinning performance in mill tests 16.

In 1956-57, *35/1* covered an area of 64,000 acres in the State. The additional income obtained by cotton growers by planting this variety has been estimated at nearly 10½ lakhs of rupees.

The Indian Central Cotton Committee is at present financing a scheme for the distribution of seed and extension of this improved cotton variety, and expects to cover an area of 1½ lakhs of acres in the districts of Meerut, Muzaffarnagar, Bijnor, Saharanpur and Moradabad.



BETTER-YIELDING NIGER

A BETTER-YIELDING niger, *N-12-3*, suitable for growing in the Bombay-Deccan has been recently evolved at the Agricultural Research Station, Niphad, in District Nasik of Bombay State.

Niger is one of the minor oilseed crops grown in Bombay State, mostly in the Deccan. The crop is grown under conditions of moderate rainfall not exceeding 40 inches in the hilly tracts. Besides oil, niger yields an oilcake which is a good cattle feed.

The new variety has given better yields when tried on farmers' fields. It also has a higher oil percentage.

STORING POTATOES

Trials carried out at the Patna Regional Station of the Central Potato Research Institute show that potatoes can be conveniently stored in rural potato stores.

Such a store has double walls of *kachha* bricks with a six-inch space between the walls. The air gap between the walls provides a good insulation against heat. The roof of the store is covered during the rainy season with a thick thatching material and country tiles.

More openings are provided at the base and the top of the outer wall. These help the air between the walls to be renewed. These openings can be opened at night and closed during daytime, when necessary.

The air inside the store can also be renewed through the openings provided on either side of the gable walls near about the roof level. These openings can be closed at night.

A door with two windows provided on the northern wall makes a quick fall in the inside temperature of the roof possible when the outside temperatures are lower at night.

Under Patna conditions, it has been found that with these facilities, the temperature inside the store can be kept 20° to 25°F lower than the outside temperature.

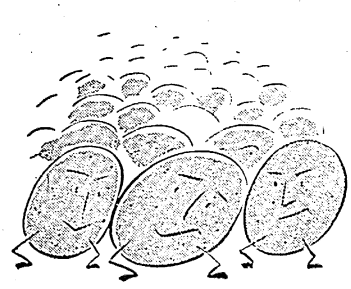
A few precautions have to be observed if potatoes are to be stored successfully.

Store only clean, selected and graded potatoes. Place the tubers on wooden bamboo racks. The layers should never be more than a foot deep.

It is better to cover the potatoes with sand. Covering successive layers of tubers with river sand to the thickness of about an inch helps prevent tuber moths from attacking the potatoes. The potato moth can also be controlled by pretreating the tubers with five per cent DDT. Mix the DDT with fine dust and apply at two ounces per maund of potatoes before storing.

Examine the tubers from time to time for sprouts and for rotting. Remove the sprouts in case they are excessive during the later period of storage. If you see tubers rotting, it will be necessary that you sort out rotting tubers from time to time.

When storage is done under country methods, store only such varieties that can withstand high temperatures in storage.



The 'Set of Four' for Bihar Farmers

by
G. Mohiuddin
Chief Engineering Instructor
Extension Training Centre
Muzaffarpur

FOR the last many years, farmers in Bihar are being advised to use a set of four improved implements on their farms.

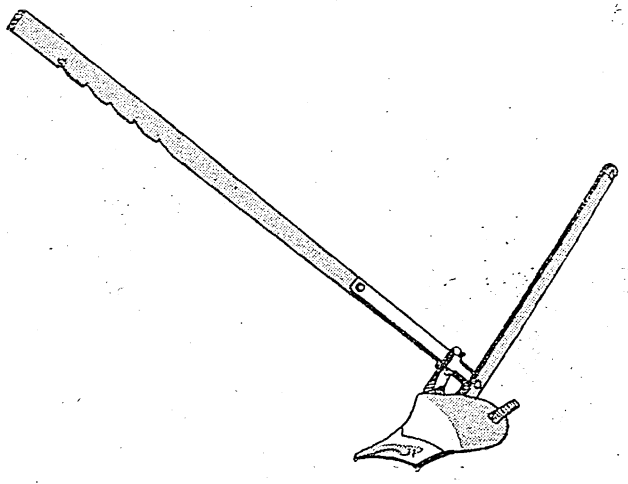
These implements, called Bihar implements, are useful for different farm operations. Saving labour and time and very effective in their working, these implements are getting very popular among the farmers.

The set of implements consists of the Bihar Junior Plough, Bihar Senior Plough, the Bihar Ridging Plough (Junior and Senior) and the Bihar Cultivator.

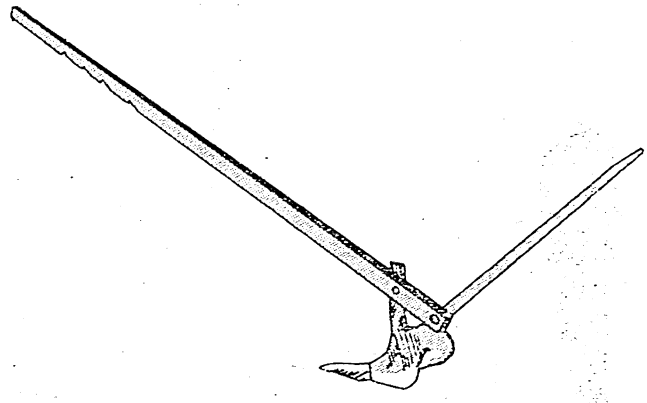
BIHAR JUNIOR PLOUGH

This is a six-inch general-purpose cast-iron mould-board plough. The share has a share-point also. It has a single handle and a long beam, both made out of *sal*. The Plough weighs 20 seers and costs about Rs. 33. The Plough can be worked by small to medium-sized bullocks.

The Bihar Junior Plough—suitable to work with small bullocks



The Bihar foursome would be incomplete without this extremely useful Ridging Plough



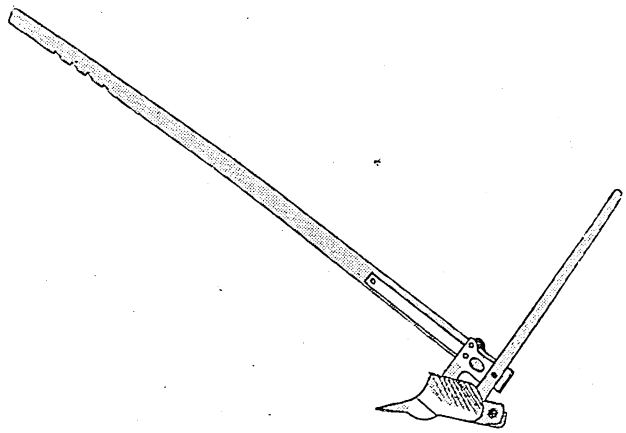
A special feature of this plough is that it turns the soil to the left unlike most mould-board ploughs which turn it to the right. The soil being turned towards the left, it will be towards the centre of the field, which helps in improving drainage and the crop-bearing capacity of the soil.

The Junior Plough is used for ploughing lands for *rabi* and *kharif* crops, inverting and burying green manures, preparing the seed-bed for sugarcane and other crops and also for breaking new ground.

BIHAR SENIOR PLOUGH

This is an eight-inch general-purpose cast-iron mould-board plough. The point of the share steps into its nose either way up. When one side wears out, the other side can be turned down. When both sides are worn out, the point can be replaced. The Plough also has a single handle and a long beam, both of *sal*.

The Bihar Senior Plough performs many functions...



The Plough weighs 32 seers (with the woodwork) and costs about Rs. 44.

The Senior Plough can be worked by medium to heavy-sized bullocks. With this plough, the soil is turned to the left as with the Junior Plough. It does a better job of ploughing, inverting and burying green manures and preparing seed-beds for crops.

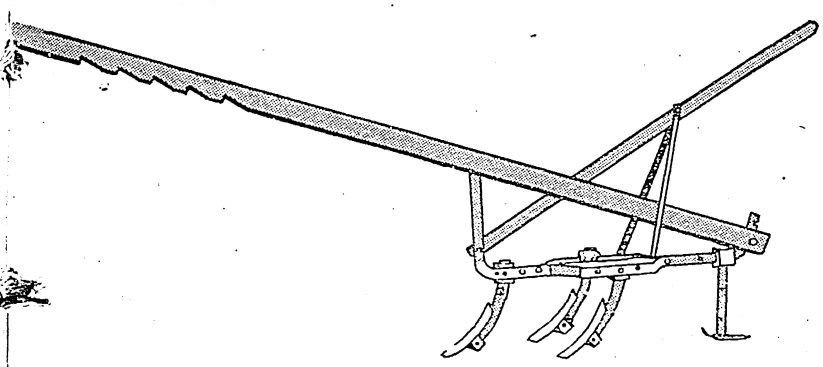
BIHAR RIDGING PLOUGHS

The ridging plough is of two sizes, Junior and Senior. The Junior Ridger weighs 15 seers and costs about Rs. 27. The Senior, about Rs. 49. The Junior Ridger makes ridges at smaller distances, while the Senior makes ridges 30 inches apart. Both the ridgers are useful for making irrigation channels, ridges for row-crops and for earthing in sugarcane, maize and potatoes.

BIHAR CULTIVATOR

The cultivator is mainly an intercultural implement, but the Bihar Cultivator is a multi-purpose implement. This cultivator makes furrows six inches deep. Fitted with three tines, it can be drawn with a pair of small bullocks, but a pair of larger-sized bullocks would be needed if it is fitted with five tines. The Bihar Cultivator is useful for seed-bed preparation after ploughing and for interculture of row-crops like maize, potatoes, sugarcane, tobacco and vegetables. A three-tine cultivator weighs 21 seers and costs about Rs. 34. If converted into a five-tined one, it will add six more seers in weight and about Rs. 11 in cost.

...so does the Bihar Cultivator



Among these implements, the Junior and Senior Ridging Ploughs have become very popular with the farmers of the State, especially in north Bihar. The mould-board ploughs, however, have not had the same response probably because they are costlier than steel ploughs of the same size. Again, cast-iron being inferior to steel, cast-iron ploughs are getting obsolete.

The Bihar Cultivator is a single handle cultivator. Probably, if two handles are provided, it will be better, because then it will facilitate a steady operation, especially when interculturing a crop. If a funnel and seeding spouts are also attached to this implement, it will reduce the cost of sowing seed.

Research work in this direction is being undertaken in the State to bring about improvements in these implements.

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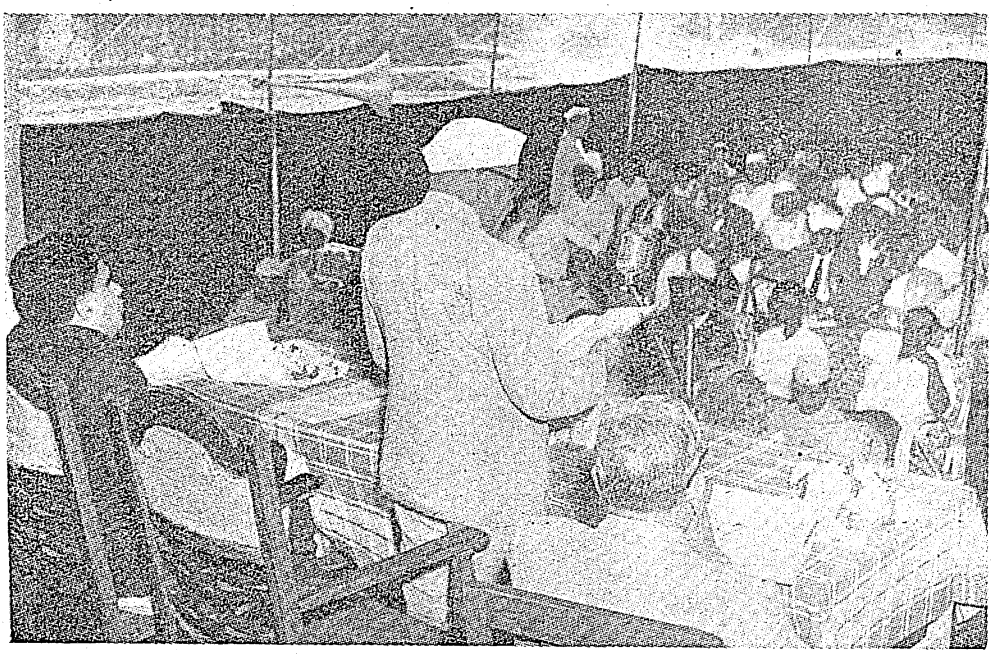
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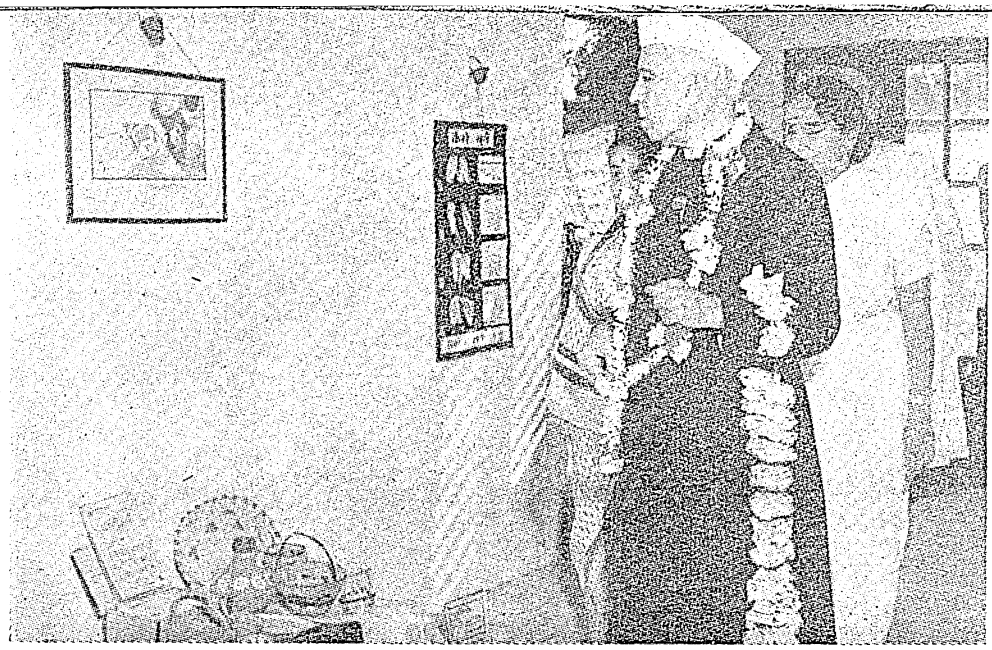
On the occasion of the Fourth National Convention of Farmers last month, a Convention of the Bharatiya Gramin Mahila Sangh was also held. The function was attended by women-delegates from all parts of the country and was presided over by Shrimati Rajbansi Devi (second from right on the dais)

FARMERS MEET IN FOU

Before the Convention, a Cattle Breeders' Conference



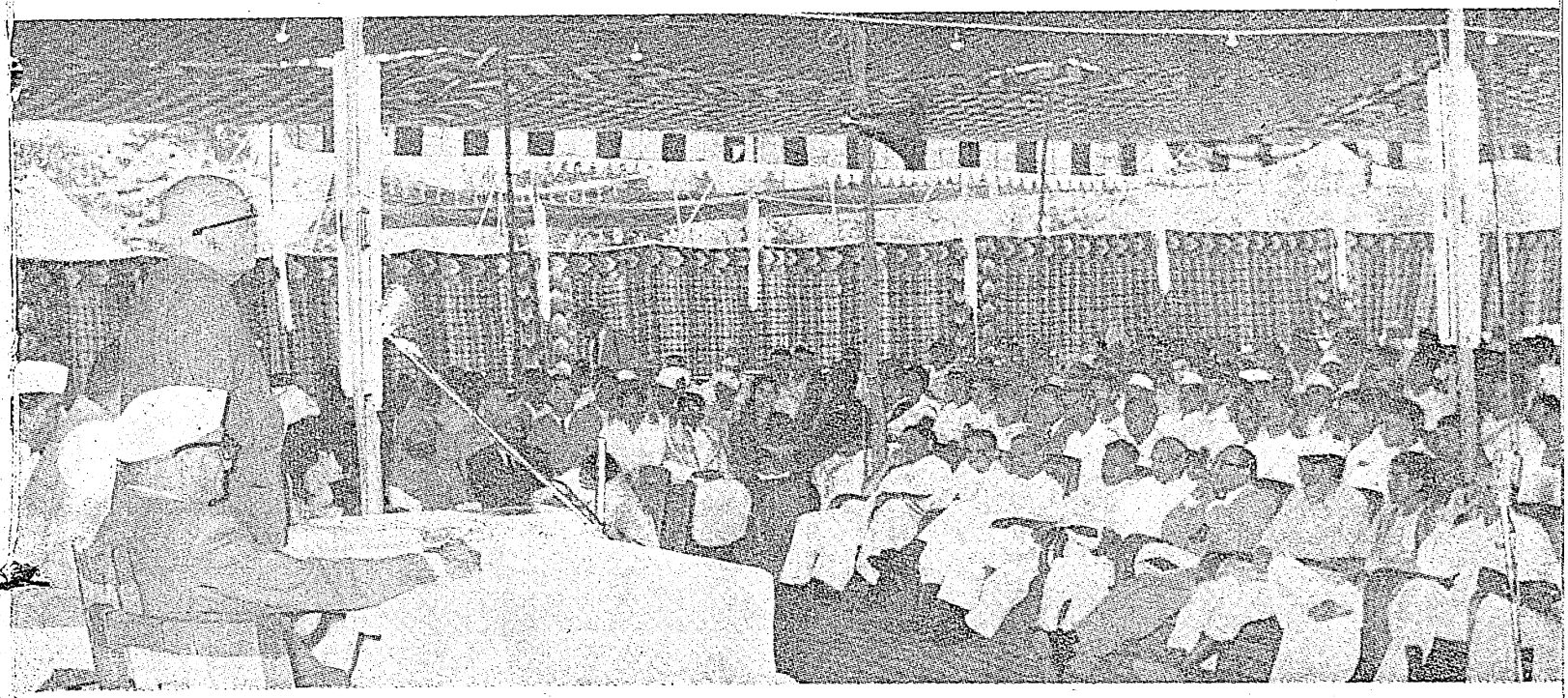
Dr. P.S. Deshmukh, Union Minister for Co-operation, inaugurating the All-India Cattle and Poultry Breeders' Conference in Delhi on March 13, 1958. On his left is Shri M.V. Krishnappa, Deputy Minister for Agriculture. The Conference was attended, among others, by delegates from Bihar, Assam, Kerala, Orissa, Madras, U.P. and Delhi



The Prime Minister, Shri Jawaharlal Nehru, being conducted round a model hut for Gram Sevikas which formed a part of an Exhibition organized in connection with the Convention

R'TH NATIONAL CONVENTION

Shri V.T. Krishnamachari, Deputy Chairman, Planning Commission, inaugurating a Seminar on "Farmers' Forum in Agricultural Extension" held during the Convention



the fertilizer way to more paddy

INTERESTING results have come out of a large number of trials conducted in India during the last three years under an Indo-American Project for determining soil fertility and fertilizer use. All the trials were conducted on farmers' fields.

The trials were conducted over a wide range of soil and cropping conditions. They were designed to study the response of the paddy crop to varying doses of nitrogen, phosphate and potash, and also to find out how the newly-developed nitrogenous and phosphatic fertilizers perform in the various soils. The optimum time and the best method of application of the fertilizers were also included in the programme.

The results of the trials conducted for three years have been averaged to cover yearly variations. The findings, detailed below, are of great interest to farmers.

NITROGEN GIVES LARGER YIELDS

In practically all the trials, the application of nitrogen increased the yields. Results of 1,628 trials conducted in 11 important paddy-growing states indicate that the application of 1¼ maunds (20 pounds nitrogen) of ammonium sulphate per acre increased the yield of paddy by 4.5 maunds per acre, and 2½ maunds of ammonium sulphate (40 pounds nitrogen) per acre increased the yield by 6.6 maunds per acre.

RESPONSE FROM PHOSPHATE

Good increases in yields were obtained with phosphates, especially on soils which were low in phosphorus. The average results of 1,182 trials showed that by applying 1½ maunds of superphosphate, the increase in yield was 3.6 maunds of paddy per acre, and with three maunds of superphosphate the increase was 4.9 maunds of paddy per acre. Incidentally, the experiments also showed that phosphate was lacking in most Indian soils.

Additional yields of paddy obtained by applying...



...20 pounds nitrogen as ammonium sulphate

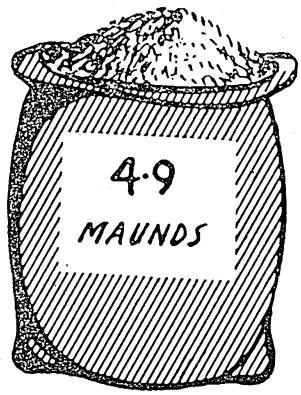


...40 pounds nitrogen as ammonium sulphate

...20 pounds P_2O_5 as superphosphate



...40 pounds P_2O_5 as superphosphate



PROFIT FROM FERTILIZERS

The trials have indicated that the most economic dose of fertilization for paddy is 1¼ maunds of ammonium sulphate plus 1½ maunds of superphosphate. The economics of manuring on an all-India basis can be seen below.

Dose of fertilizers (*Md. per acre*)	*Cost* (*Rs.*)	*Additional yield* (*Md.*)	*Value of additional produce* (*Rs.*)	*Net profit per acre* (*Rs.*)
1¼ md. ammonium sulphate (20 pounds nitrogen)	17	4.5	54	37
2½ md. ammonium sulphate (40 pounds nitrogen)	34	6.6	79	45
1½ md. superphosphate (20 pounds P_2O_5)	13	3.6	42	29
3 md. superphosphate (40 pounds P_2O_5)	26	4.9	59	33
1¼ md. ammonium sulphate+1½ md. superphosphate (20 pounds nitrogen + 20 pounds P_2O_5)	30	6.6	79	49
2½ md. ammonium sulphate+1½ md. superphosphate (40 pounds nitrogen+ 20 pounds P_2O_5)	47	7.9	95	48

For purposes of calculation, the cost of fertilizers has been taken at Rs. 380 per ton of ammonium sulphate and Rs. 225 per ton of superphosphate. The sale price of paddy has been taken at Rs. 12 per maund.

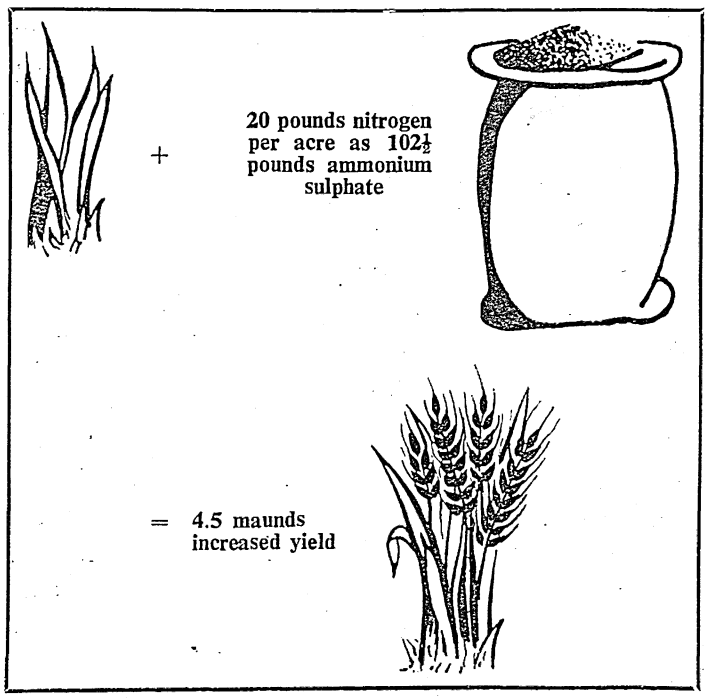
With these rates, a combination of 1¼ maunds of ammonium sulphate and 1½ maunds of superphosphate gives the maximum net profit of Rs. 49 per acre on an investment of Rs. 30. With the application of 2½ maunds of ammonium sulphate and 1½ maunds of superphosphate the highest extra yield, but with a slight difference in net profit, was obtained.

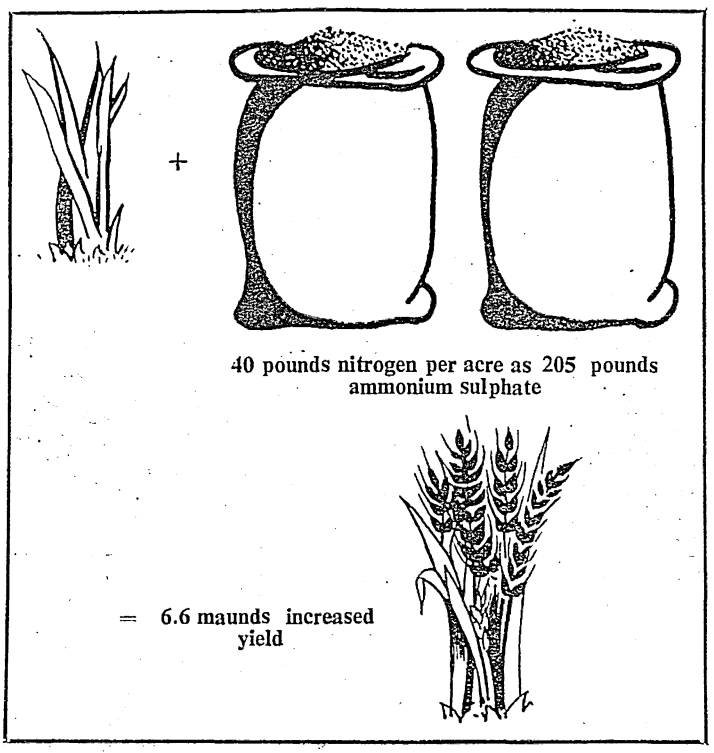
VARYING FERTILIZER NEEDS

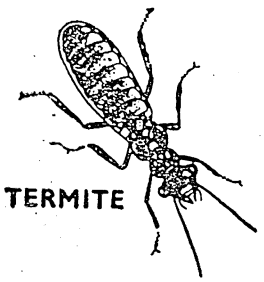
The additional yield of paddy obtained by applying the same doses of fertilizers varied from locality to locality. However, it was clear that nitrogen was required universally while phosphorus was required for many soils. Hence, the kind of fertilizer and the quantity recommended have to differ from one area to another. The increase in yield of paddy (in maunds) by applying different levels of nitrogen and phosphate and their combinations in various areas can be seen in the Table on page 26.

SOURCES OF NITROGEN

Voluminous data have been collected on the effect of sources of nitrogen on paddy yields. In these experiments, nitrogenous fertilizers compared were ammonium sulphate and urea. At a few places, ammonium nitrate and nitro-chalk were also compared with ammonium sulphate.





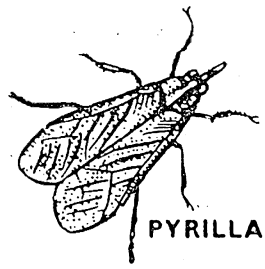


TERMITE

'GAMMEXANE' D.025

Dust applied to the setts in the furrows at the rate of 25 lbs. per acre along with the fertilizer at the time of planting will control Termites which otherwise render some fields unsuitable for sugarcane cultivation.

'GAMMEXANE' WDP

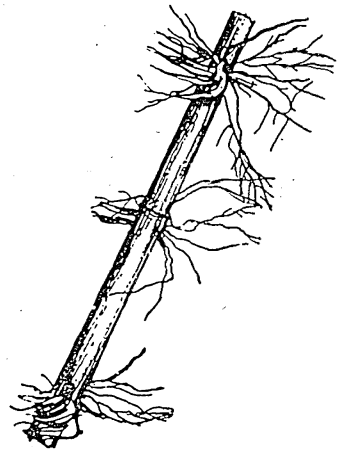


PYRILLA

at 5 lbs. in 100 gallons water per acre or 'Gammexane' D.120 Dust at 30-40 lbs. per acre controls pre-monsoon attacks of the highly destructive pest, Pyrilla. To control post-monsoon attacks use 5 lbs. 'Gammexane' WDP in 100 gallons water or 50-60 lbs. of 'Gammexane' D.025 Dust per acre.

'GAMMEXANE' INSECTICIDES ARE MANUFACTURED BY THE ALKALI & CHEMICAL CORPORATION OF INDIA LTD., AT RISHRA, WEST BENGAL

'ARETAN'



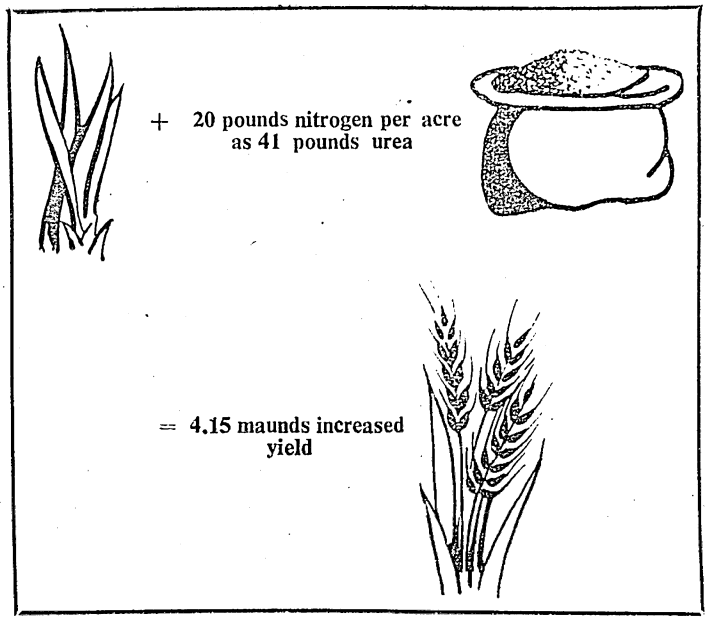
is a mercuric sett dip, which stimulates germination, ensuring a better, healthier and higher-yielding stand of cane. 'Aretan' is now 'Double Strength' and therefore even more economical.

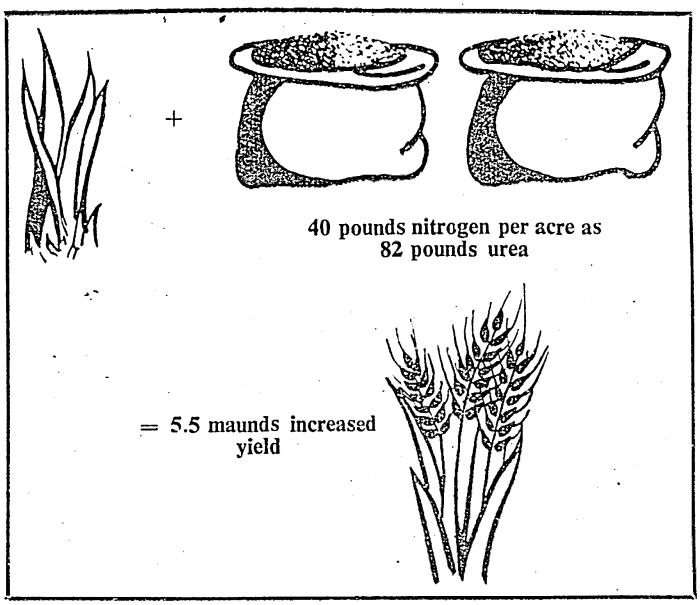
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The trials showed that ammonium sulphate is slightly superior to urea when the lower dose of fertilization is used. But the difference was a little more over urea when the highest dose of topdressing was used. As the cost of nitrogen in urea is comparatively less than in ammonium sulphate, either of these fertilizers can be used with equal profit if a lower dose of fertilization is intended.

SOURCE OF PHOSPHATE

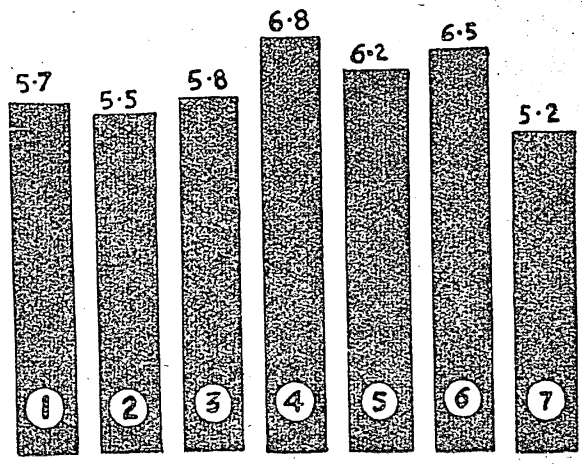
At most places, superphosphate was compared with bonemeal at 20 and 40 pounds of P_2O_5 per acre. The response was more or less the same with superphosphate and bonemeal, which showed that either of the two can be used by farmers with profit.

TIME OF APPLICATION

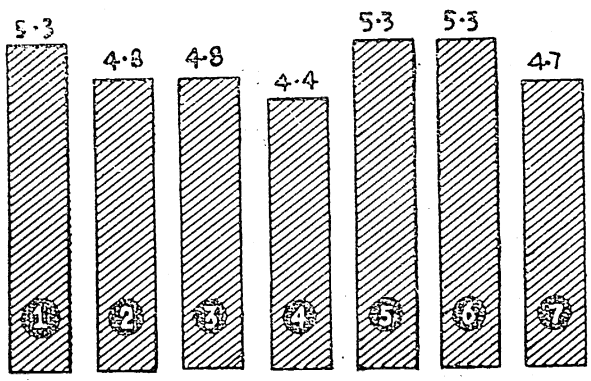
At 11 places, the optimum time of application of nitrogenous fertilizers was investigated. Results show that for the late varieties it is best to apply the nitrogenous fertilizer in split doses. For medium and early-duration varieties, however, the fertilizer may be applied either in a single dose or in split doses according to the weather conditions obtaining and the convenience of the farmer.

The trials have shown beyond doubt that farmers can get higher yields of paddy if they combine the fertilizer recommendations for their area with other good cultural practices, as specified in the Japanese method of paddy cultivation.

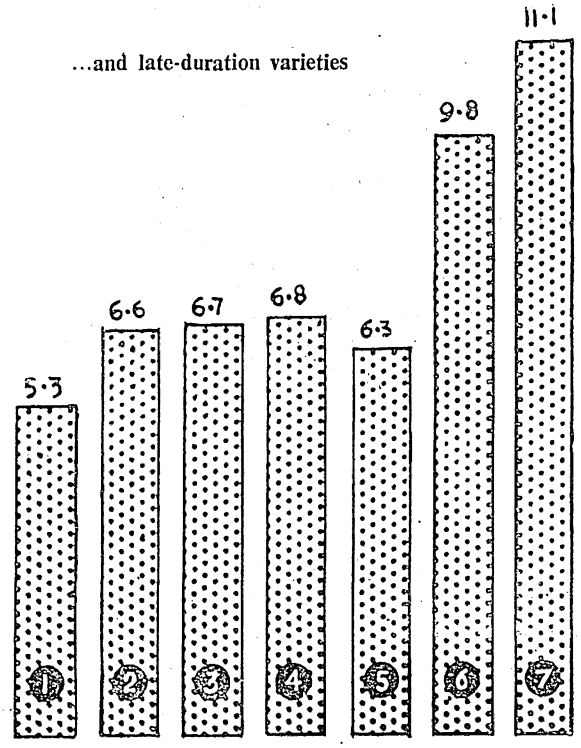
Additional paddy yield obtained by applying 30 pounds nitrogen per acre at different times : 1. Before planting 2. At planting 3. At tillering 4. Half before planting and half at tillering 5. Half at planting and half at tillering 6. One-third before planting, ⅓rd at tillering and ⅓rd a week before flowering 7. One-third at planting, ⅓rd at tillering and ⅓rd a week before flowering, with...



...early-duration varieties



...medium-duration varieties



SOIL-TESTING

In this context farmers should also know of another benefit that has come to them. Sixteen soil-testing service laboratories have already been established in our country and eight more are being located soon. If soil samples, along with the history of the crops grown, the yields obtained and the kind and quantity of plant food applied and the crops to be grown, are sent to these laboratories, farmers will obtain in return necessary recommendations giving the kind and amount of fertilizers they should apply to get best yields from their crops. This service is free. Every farmer, therefore, should have a soil test made before he applies fertilizers. Your Village Level Worker or Agricultural Officer will be able to give you detailed information about how to draw a soil sample and where to send the same.

Your Questions and Suggestions are Welcome !

Address them to the Editor, "Indian Farming", Indian Council of Agricultural Research, Queen Victoria Road, New Delhi-2

Name of the Community Project	*Agro-climatic region*	*Soil type*	*Levels of nitrogen and phosphate and their combinations*				
			20N	*40N*	*20P*	*20N+ 20P*	*40N+ 20P*
Agartala Development Block (Tripura)	North-eastern region	Alluvial	4.9	6.9	3.7	6.0	7.4
Darrang Community Project (Assam)	do.	do.	6.9	5.0	10.0	12.3	6.3
South Kanara Project (Madras)	Western region	Coastal alluvium	0.9	3.1	1.7	2.8	4.3
Kakinada-Peddapuram Community Project (Andhra)	Southern region	do.	2.9	5.3	2.5	6.3	7.4
Rameshwar Development Block (Bihar)	North-eastern region	Red loam	3.8	7.1	3.3	5.8	7.4
Junagarh Community Project (Orissa)	do.	do.	5.6	12.3	3.1	7.6	7.9
Kunnathunad Chalakudy Project (Kerala)	Southern region	Laterite	3.2	5.1	2.3	4.9	7.4
Raipur Community Project (M.P.)	Central region	Red and yellow	5.2	9.0	3.5	6.9	10.5
Nizamabad Development Block (Hyd.)	North-eastern region	Grey med. black	2.3	1.3	2.7	4.5	6.3
Nilokheri Community Project (Punjab)	Northern region	Grey and brown	5.2	5.6	3.0	6.0	7.5
Pusa-Sumastipur Sakra Project (Bihar)	do.	Grey and brown	8.5	12.2	3.4	10.0	14.0



Milch cows are a must

Farming Elsewhere

Why Farming Pays in Denmark

by

J. C. Dhar

Agricultural Training Centre

Kalyani, Nadia

DENMARK has no raw materials like petrol, coal, iron or steel and has to import all her needs. The only raw material she has is the soil, and this soil produces 66 per cent of her total exports.

Farming in Denmark is a paying business. A farmer with 25 acres or more of land is rich, owns a motor car and maintains a high standard of living.

Why is farming in Denmark so well-paying unlike in India ? I had the opportunity of finding the answer to this question. As in business, one needs some sort of security for one's investment in farming; this security is provided by a quality control over the seed distributed to farmers. This quality control assures the farmers of a sure crop, and if the crop fails because of the seed not being up to the standard, the farmer receives compensation. He can also insure his poultry, livestock and everything else on the farm so that he may not run the risk of losses through epidemics among poultry and livestock, or due to any untoward happenings on the farm.

Consolidation of holdings and large-scale mechanization have enabled the farmers to produce crops at a lower cost, thereby increasing their margin of profit. I worked on a 1,000-acre farm for three months. This farm was managed by only 15 workers. This was possible because of full-scale mechanization. Ten years ago, there were only 10,000 tractors in Denmark, but now the number has exceeded 50,000.



Rolling the land with a tractor and the Cambridge roller



Tractor-drawn hoes hoeing a row-crop

CO-OPERATIVE MARKETING

Co-operative marketing organizations have helped eliminate middlemen, and have assured to farmers a good price for their produce. The farmers are no longer bothered by marketing problems and as such can devote more time to their farms. These organizations also purchase seeds and fertilizers for the farmers.

The co-operative societies handle 91 per cent of the total milk produced, 91 per cent of the animals slaughtered, 64 per cent of the total butter, 35 per cent of the eggs produced, 45 per cent of the seeds supplied, 53 per cent of the purchase of farm requisites and 39 per cent of the total fertilizer sales in the country.

Even small holders who cannot afford costly machinery obtain their requirements through co-operative organizations, and are thus able to reduce the cost of production so that they may also compete with the large-scale producers.

Co-operative banks or the Mortgage Credit Association advance capital to farmers at a very low rate of interest. Fifty-four per cent of the rural credit is through co-operative banks.

BALANCED ECONOMY

An important feature of Danish agriculture is its balanced economy. About 98 per cent of the farms are mixed farms ; they produce grain and fodder, and milk and butter. By-products such as skim-milk and whey go to feed the pigs for bacon, and the rejected grains for pigs and poultry birds.

Danish farmers are able to adapt themselves to changed conditions. Before 1880, Denmark, being a grain-producing country, used to export grain, but when from that year cheap grains from Siberia and Canada began to flood the European markets, the Danish farmers changed their system of farming to livestock farming and began exporting livestock products.

The Danish farmer gets the benefit of the advice of highly qualified agricultural advisers who keep him posted with the latest developments in agricultural science.

He has also the benefit of a good educational background, as he has the facility of attending agricultural schools, agricultural colleges or Folk high schools.

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Jowar—

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UNDER dry farming or irrigated conditions, *jowar* is one of our most popular fodder crops.

Of tropical origin, *jowar* is suited for growing in regions of low rainfall not exceeding 40 inches a year. It is well-adapted to the warm climate prevailing in the *kharif* season throughout the country. It gives the best stand when humidity is high; withstands fairly long drought spells during the monsoon.

No degree of summer heat is intense enough for *jowar*, if the soil contains enough moisture needed for its growth. Hence, it is possible to grow the crop both under unirrigated and irrigated conditions with equal ease.

Jowar is a favourite fodder crop grown for green fodder or hay (*kadbi*) in Uttar Pradesh, the Punjab, Rajasthan, Madhya Bharat, Bombay, Andhra Pradesh, Madras, Bihar and Jammu.

The best crops of *jowar* are raised on the heavier types of soils, though extensive areas of black cotton and alluvial soils are grown with *jowar* every year. Red and laterite soils are also put under *jowar*, but *ragi* finds more favour on such soils, particularly in Telangana in Andhra Pradesh, and also Mysore.

Under dry farming conditions, the best *jowar* crops are raised on the black cotton soils of Bombay State. Under irrigation, alluvial soils give as high an outturn as the best of the black cotton soils under similar conditions.

Jowar, as a rule, exhausts the soil of its nutrients. It has a strong root system, spreading out vertically and laterally, and holding the soil firm. Even on light soils, it is seldom that you come across the lodging of a heavy crop.





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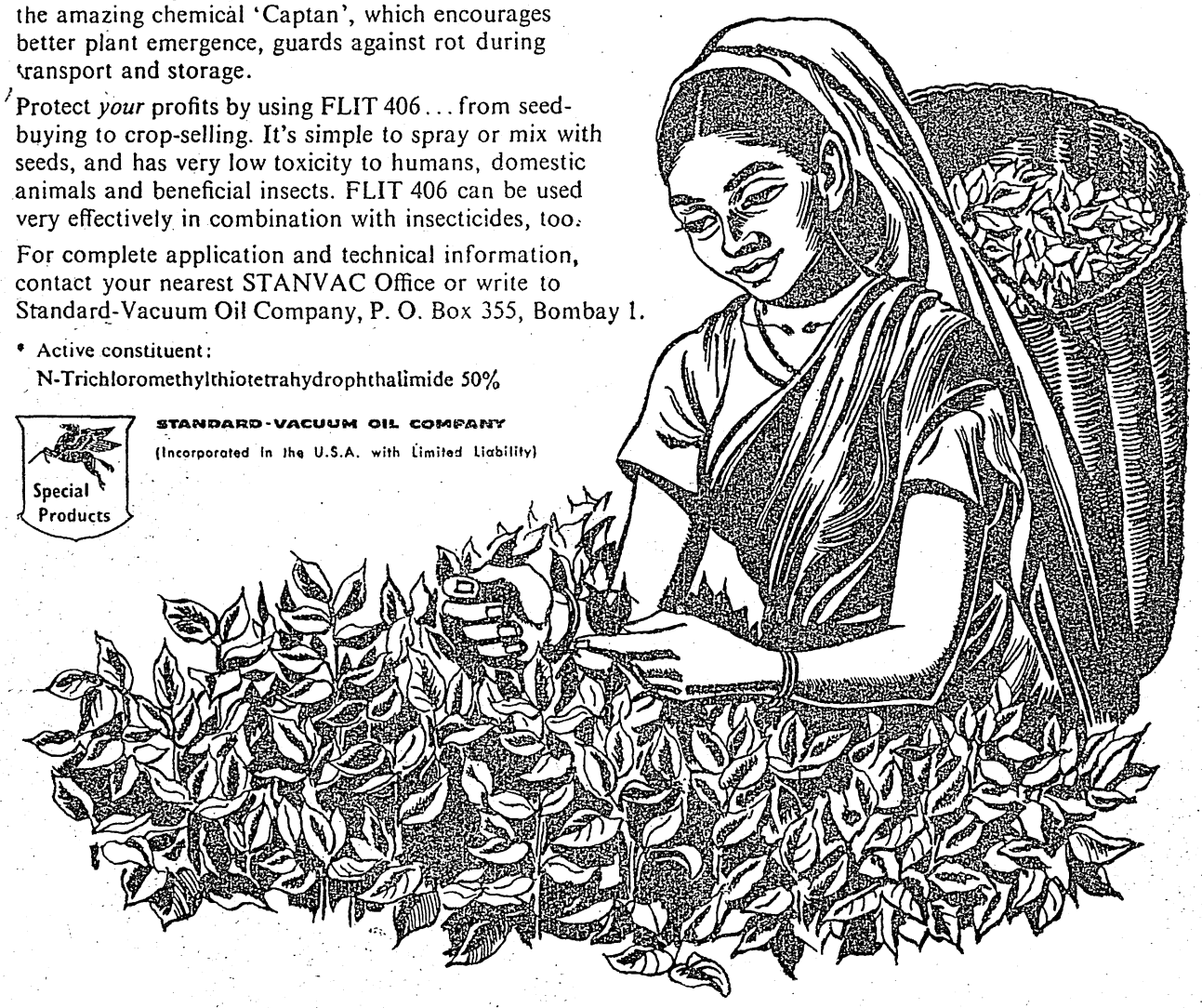
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For a good stand, *jowar* needs a well-drained soil. It suffers in growth when there is water-logging, but grows luxuriantly under sullage.

Experiments at Rageri, Nandyal and Guntur (Andhra Pradesh) and Poona and Anand (Bombay State) have shown that deep ploughing the soil once in four years is of benefit in the clayey soils of south India. Similarly, bunding increases the fodder and grain yields in dry farming areas.

VARIETIES

A number of new *jowar* strains have been evolved in many states. Bombay has a good number of them, particularly the *Sundi jowar*, a heavy yielder with thin stalks and plenty of leaf. Under favourable conditions, this gives good hay in 60 days of planting. Strain *S. 1049* has been a successful one as a fodder *jowar* at the B.A. Institute of Agriculture at Anand.

The dry areas of Sholapur grow a strain called *Hundi*. Several more are grown by farmers, and variety *M-35/1*, a *rabi jowar*, is the strain popularized by the Agriculture Department.

Nandyal, a selection from Madras, is grown in Kolhapur and Dharwar districts. Wherever there are irrigation facilities, the strain *Natavali* is grown. In the Deccan, they grow a coarse variety, *Nilwa*. It is slow-growing and gives a second cutting, provided the first cutting is taken when the crop is still young.

In Madras, among the long-duration varieties, *Periamanjal cholam*, with sweet stalk, is preferred for growing. Among the short-duration varieties—*Chinna cholam*, *Irungu cholam* is the popular fodder variety. Here also, the preference goes to the sweet stalk.

In Madhya Pradesh, *Malwi* is the popular fodder variety. In Mysore, *Kakki jola*, a tall-growing, white-grained and leafy variety, and *Vogaru jola*, a red-grained, tall and leafy variety, are the common ones.

The Punjab has a number of high-yielding varieties. *Pb. Type 263* is medium tall (65 to 80 inches) with a medium thick but sweet and juicy stem. The fodder, ready in 65 days, averages 625 maunds to the acre.

Pb. Type 100 is a slow-growing variety compared to *Pb. Type 263*, and takes a week or ten days to be ready for fodder. Its fodder outturn is high, but it is a moderate seed-setter.

Pb. Type 21 is a medium tall, sweet variety, somewhat late, and needs more irrigation. The fodder yield is quite high, exceeding 500 maunds per acre, but the *kadbi* cannot be stored for long.

Uttar Pradesh grows *Purbi jowar* in the eastern and central regions and *Malwi jowar* on the black cotton soils of the Bundelkhand tract, including the Jhansi district.

PREPARING LAND FOR THE CROP

For fodder *jowar*, the soil is generally not intensely cultivated. The stubble is usually broken in *barani* or medium rainfall areas by ploughing once or twice with a *desi* plough in alluvial and red soils. In black cotton and laterite soils, the fields are harrowed with a *bakhar* or *guntaka*, particularly when the texture of the soil is heavy. Before sowing, the field is again ploughed or harrowed twice. Thus, normally, four operations are given to prepare the land.

First, the soil is turned with a soil-inverting plough, and the subsequent two or three operations are carried out with the *desi* plough or the *bakhar*. Where land is tractorized, usually grubbing and discing, twice each, have proved to be an adequate tillage. The frequency of cultivation also depends upon the preceding crop. Deep ploughing is necessary only where *jowar* follows sugarcane, cotton or *arhar*.

SOWING

Irrigated *jowar* is sown early for fodder. It is often mixed with legumes such as *moth* (*Phaseolus aconitifolius*), cowpea, *val* (*Dolichos lablab*), etc. The mixed crop is usually sown broadcast. The seed-rate for pure *jowar* is about 20 seers per acre.

Experiments at Sirsa (Punjab) have shown that any increase in seed-rate above 20 seers does not increase the fodder outturn. When sown mixed with a legume, the seed-rate is reduced to half, as it is mixed with half the normal seed-rate of the fodder legume.

Under irrigation, early sowings start in March. The seed is sown in a moist seed-bed. Normal sowings are done in June-July when the monsoon sets in. Late sowings are continued up to mid-August.

In dry areas, the seed-rate used is as high as a maund per acre, sowing being always by broadcasting. For *kadbi*, a thick sowing is usually preferred to a thin sowing, as stalks will then remain thin, having a superior feeding value. In rain-fed areas, advantage is taken of the early heavy showers for sowing. A late-sown crop yields poor. Sowing the crop mixed with a legume is less common in these areas.

IRRIGATION

The sowing period of the main crop synchronizes with the monsoon. Usually, no irrigation is needed unless the rains fail when one or two irrigations would be found necessary. The early-March-to-May-sown crop requires an irrigation for sowing and subsequent irrigations at ten to 15 days' intervals. The late-sown crop normally requires one irrigation late in September. The normal water requirement of the *jowar* crop for fodder is about 20 acre-inches.

MANURING

Where *jowar* is raised for fodder year after year without an intervening crop, the soil is seldom given any manure or fertilizer, except in dairy tracts like Gujarat and Saurashtra in Bombay State, where a dressing of three to four tons of cattle manure is given. Manure applied six to seven weeks in advance of sowing gives a good response.

But the fodder crop responds very well to nitrogenous fertilizers. A dose of 50 pounds of nitrogen (250 pounds of ammonium sulphate) increases the yield by a 100 to 150 maunds, provided the soil has a good store of moisture. A dressing of a 100 pounds of ammonium sulphate under unirrigated conditions is recommended, particularly if the farmer cannot afford

to manure the crop with farmyard manure. This should preferably be applied at sowing time.

INTERCULTURE

Usually, the fodder crop is sown thick so that few weeds come up in the field to compete with *jowar*. But one weed which suppresses the growth of *jowar* is *baru* (*Sorghum halepense*). An intensive preparatory tillage helps reduce the infestation of this weed. One weeding immediately after the germination of the crop reduces the weed, and the crop comes up successfully.

In the South, *hariali* (*Cynodon dactylon*) is the weed that competes with *jowar*. Here again, preparatory tillage before sowing helps more than the subsequent interculture of the crop.

When the crop is sown broadcast, intertillage implements cannot be used. It is only in the line-sown crop that intercultivation by bullocks is possible. In weed-infested lands, line-sowing at one foot to 1½ feet distance and frequent intertilling check weed growth and lead to a good stand of the crop. This is very beneficial under dry-farmed areas.

HARVESTING

The crop is harvested for fodder after 60 to 70 days' growth. At this stage, the ears just begin to emerge. In its early stages, *jowar* contains hydrocyanic acid, and, therefore, should not be fed to cattle. Later on, the acid gets reduced to a very small quantity and the fodder is safe, and can be harvested.

Harvesting should be carried out before the lower tier of leaves begins to yellow or the stems tend to be woody. The thinner the stem and the more leafy the fodder, the better it is relished by cattle.

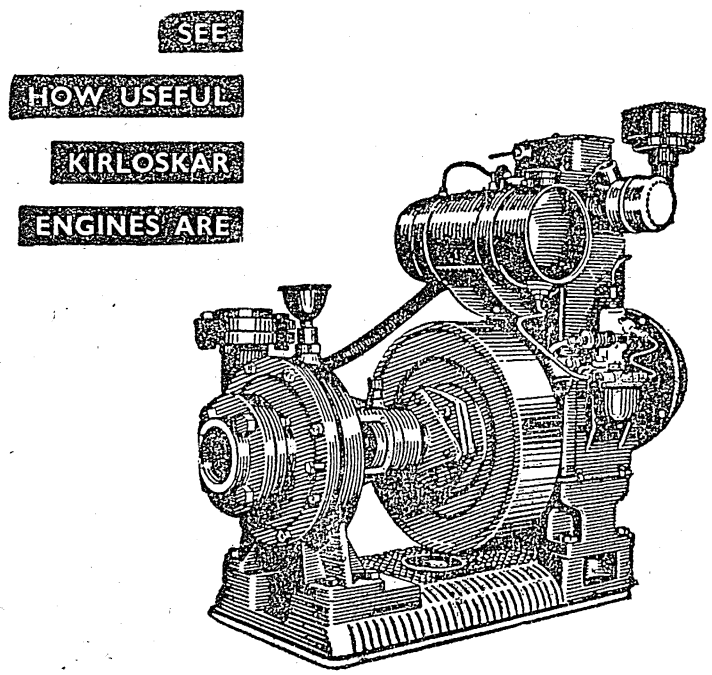
The crop is harvested for *kadbi* just about ten to 15 days before it is completely mature. At this stage, the grain is in the 'soft dough' stage and the crop is ready for *kadbi*, and the stalks still contain enough proteins. When completely mature, the stalk is poor in nutritive value.

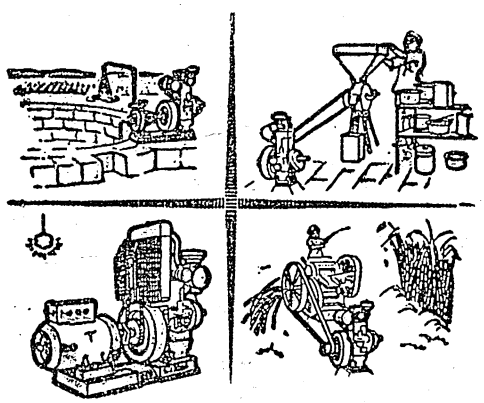
Depending upon the variety, the crop is normally ready for *kadbi* in 90 to a 100 days. It is harvested and kept in the wind-row in small sheaves and allowed to dry for three or four days. A *kadbi* which is greenish-gold in colour is the best for feeding to cattle.

FODDER MIXTURES

In the Punjab, the common fodder mixtures are *jowar*+*guara* and *jowar*+*moth*. In recent years, progressive farmers are taking to the mixture *jowar*+cowpea. The variety of cowpea highly suitable for mixed sowing is *N.P. (K)397*. This is an early variety and forms a good mixture with *Purbi jowar* of Uttar Pradesh. In canal-irrigated tracts of the Punjab and Rajasthan, these fodder mixtures are common.

In Uttar Pradesh, *jowar* is mixed sown with *moong* and *moth*. *Moong Type No. 1* gives a very luxuriant growth. For *kadbi*, *arhar* is sown mixed with *jowar* throughout Uttar Pradesh.





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In Madhya Bharat, Madhya Pradesh and parts of Rajasthan, *jowar* for fodder is usually cultivated alone. In some places, *jowar* is sown mixed with *arhar* for *kadbi* and with *moth* for fodder.

In Bombay State, the common mixtures are *jowar*+*chawli* (cowpea) and *jowar*+*val* (*Dolichos lablab*). The first one is more common in the Deccan and Marathawada, and the second in Gujarat and Saurashtra. *Rabi jowar* sown for *kadbi* is commonly sown alone.

In Mysore, Madras and Andhra Pradesh States, *jowar* for fodder or *kadbi* is generally sown alone. When sown with a legume, the black gram and red gram mixed with it are removed before the crop is ready for *kadbi*.

YIELD

Ordinarily, the green fodder outturn averages 250 maunds per acre under irrigated conditions. But with proper manuring, yields of 600 to 650 maunds can be obtained on loamy and clayey soils. The *kadbi* yield averages a 100 to 120 maunds per acre.

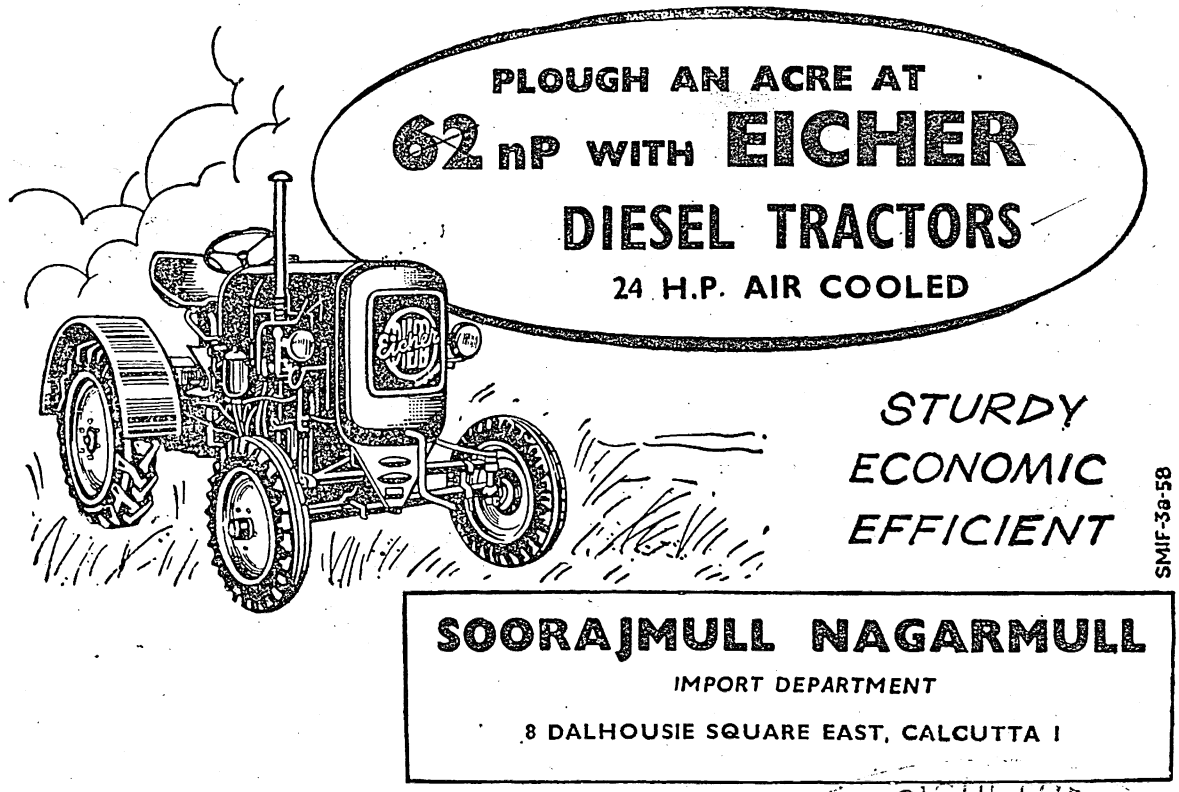
Under unirrigated conditions, the outturn seldom exceeds 250 maunds of green fodder or 75 maunds of *kadbi* even on weed-free land and with good manuring. The yields commonly obtained are 150 maunds of green fodder or 50 maunds of *kadbi*. Normally, non-sweet varieties are preferred for *kadbi*.

Silage prepared from *jowar* is much relished by cattle. The losses in silage-making vary from 25 to 33 per cent. These losses can be reduced if *jowar* is chaffed before ensilage. Addition of molasses ($1\frac{1}{2}$ per cent of the fodder) very much improves the quality of silage. This silage, like *kadbi*, comes in very useful for dairy cattle in the fodder-scarcity periods of May and June and October-November.

PESTS AND DISEASES

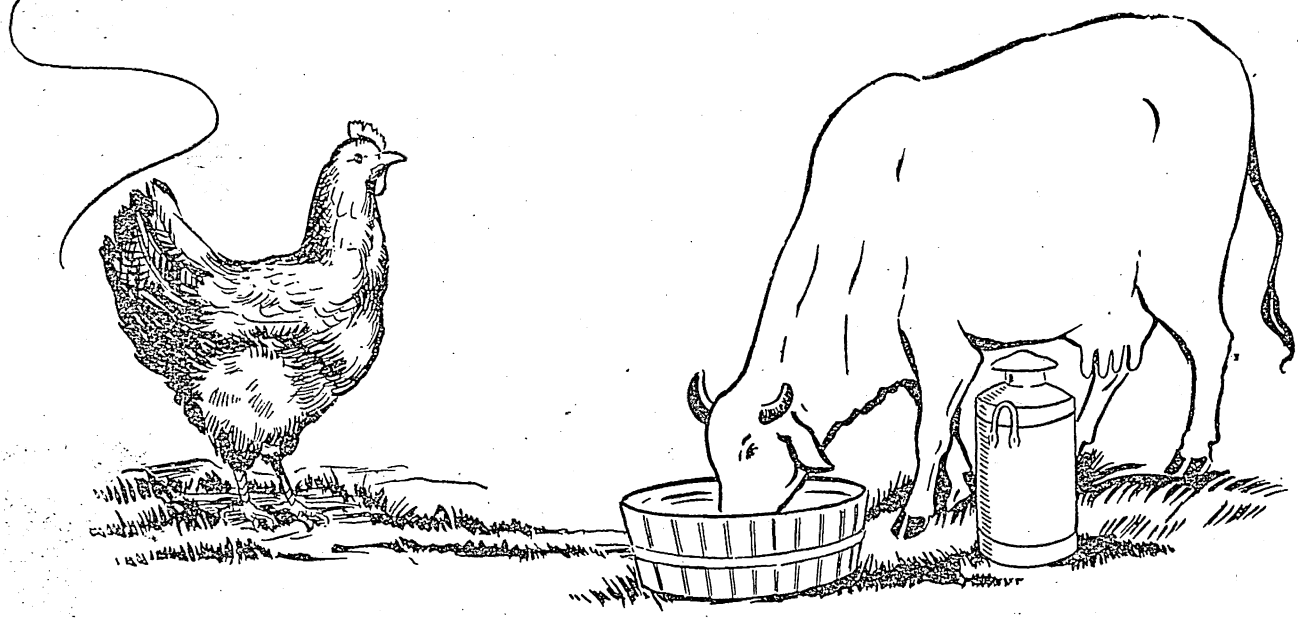
In the monsoon season, the stand of the fodder crop may be affected if there be a heavy infestation of *kutra* (*Amsectar moorei*) or *phadka* (*Hierogly-phus nigroropletus*). The former pest can be effectively controlled by setting up light traps for about a week or so immediately after the first shower of rain. The stirring of *bundhs* and embankments so that eggs of the pest are dislodged from this position also helps in controlling this pest. *Phadka* is best controlled by dusting the hoppers with five per cent BHC at the rate of 20 pounds per acre.

The serious diseases of *jowar* crop are the red leaf spot and smut of the earhead. The former occurs very commonly in sweet varieties of *jowar*. Disease-resistant varieties evolved by Departments of Agriculture should be used in areas where this disease is serious. The ear smut disease of *jowar* is controlled by treating the seed for ten minutes with a one per cent copper sulphate solution.



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AND AT SALES DEPOTS THROUGHOUT INDIA

The Farmer's Point of View

The Experiment That Paid off

by **T. R. Chandra Rao**



The green manure crop being ploughed in

FROM a little experimentation that I did, I can say that paddy yields can be easily increased.

When my father was managing our farm in village Veldipadu, Gannavaram taluk in Kistna district of Andhra Pradesh, the per-acre yield ever got was 30 maunds to the acre. In 1954, I took over the management after my father's death. That year, I was able to obtain a yield of 34 maunds to the acre. This I could do by applying chemical fertilizers. I applied ammonium sulphate, superphosphate and groundnut cake to supply 20 pounds of nitrogen and 16 pounds of phosphoric acid to the acre. The basal manure was cattle manure at five cartloads per acre.

In 1955, I was able to get enough seed of *Sesbania* and indigo to sow ten acres of land. These I sowed in November, ten days before the paddy crop was harvested. Normally, a pulse crop is grown after paddy in this tract. But, I had five acres of *Sesbania* and five of indigo instead.

Sesbania was irrigated twice, once in February and again in March. Indigo was not. The first crop produced much leaf but not indigo. In June 1956, I ploughed in the two green manure crops and transplanted paddy in the fields. At the time of ploughing the land, I applied superphosphate at a 100 pounds to the acre. I topdressed the paddy crop with ammonium sulphate and castor cake to supply 25 pounds of nitrogen, in two doses.

A SNAG

I found that with this treatment I got four more maunds of paddy per acre, as my average yield had gone up to 38 maunds. But, there was still a snag in this method. By growing a green manure crop I had lost a pulse crop. A maund of paddy sells at ten rupees. The extra four maunds of paddy I obtained brought me Rs. 40 extra per acre, but it was at the cost of five maunds of pulse valued between Rs. 100 and 120 which I would have otherwise got.

At this stage, I wondered whether I had done the right thing, and as to what I should do next. It was at this time that I heard of the results of some experiments conducted at the Agricultural College Farm at Bapatla. Here, they had tried growing a regular pulse crop and a green manure crop mixed together, and had succeeded.

So, during November 1956, just ten days prior to harvesting my paddy crop, I sowed 25 pounds of *Sesbania* seed with 30 pounds of black gram by broadcasting the same over the fields. The seeds of both were soaked in water overnight before sowing.

SATISFACTORY WORK

In the early stages, *Sesbania* did not grow well. When I harvested the black gram in February, 1957, I obtained 500 pounds of the pulse per acre. After the black gram was harvested, *Sesbania* began shooting up to eight to nine feet. Instead of waiting for it to grow further, when cutting it down would have been a problem, I cut the plants in April and heaped them in layers in different corners of the field. On each layer, I spread some superphosphate and covered up the heaps. I opened up the heaps in the first week of June, 1957, spread the manure in the field and ploughed the land. I let in water to help the green manure rot easily. The field was then ploughed and puddled, and paddy transplanted in. This paddy crop gave me an average yield of 40½ maunds per acre; that with the 500 pounds of the pulse crop made my work a satisfactory one.

In another four acres, I had grown green gram with indigo instead of *Sesbania*. After the green gram was harvested (with a yield of 560 pounds per acre), the indigo showed good progress. It was left in the field to be ploughed in later for paddy. I did not cut the crop and heap it, as I had done with *Sesbania*, to apply superphosphate to supply 20 pounds of phosphoric acid at the time of ploughing it in. These fields also gave me 40½ maunds of paddy to the acre.

(Continued on page 37)

This Sugary Sweet Hobby Really Suits Women

TWO girls, both graduates from Madras University — one specializing in Botany and the other in Economics, came out to face the future with a big question mark one day in 1948.

Their problem was : service in government, or a career which would make them self-reliant and independent ?

Soon afterwards, in Delhi, where they were attending a short course on fruit preservation, Kumari S.T. Machamma and Kumari Shanta Raghavan decided that they would both join hands and start off on an independent job of their own—making and selling fruit preserves.

Back in Madras, they pooled their resources, found all they could put by was Rs. 3,000.

With that they purchased some equipment and started off on the adventure of making a living by making fruit squashes and selling them in the city market.

'FACTORY' BASIS

With more equipment like the Mincer and Liquidizer and a food-mixer, they were able to put the industry on a 'factory' basis by 1951. The fruit products also began getting the label 'A Standard Fruit Product.'

The 'factory' occupies the ground floor of the neat little house at No. 3 Gandhinagar, a near suburb of Madras; on the first floor are the living rooms for the two worker-proprietor girls.

When I visited the factory in February last, they were both busy tidying it up. A neat, airy room displayed rows of bottles of squashes ready for the market.

Asked whether they did not hire out any workers, Machamma said "We don't need any. Ours is a small concern. We do all the processing ourselves. A woman helps us with the house ; a boy runs the errands, including delivering the bottles to the customers."

SPECIAL PRODUCTS

Asked what products they specialized in, she said, 'mango, pineapple, lime, orange squashes and lemon barley.'



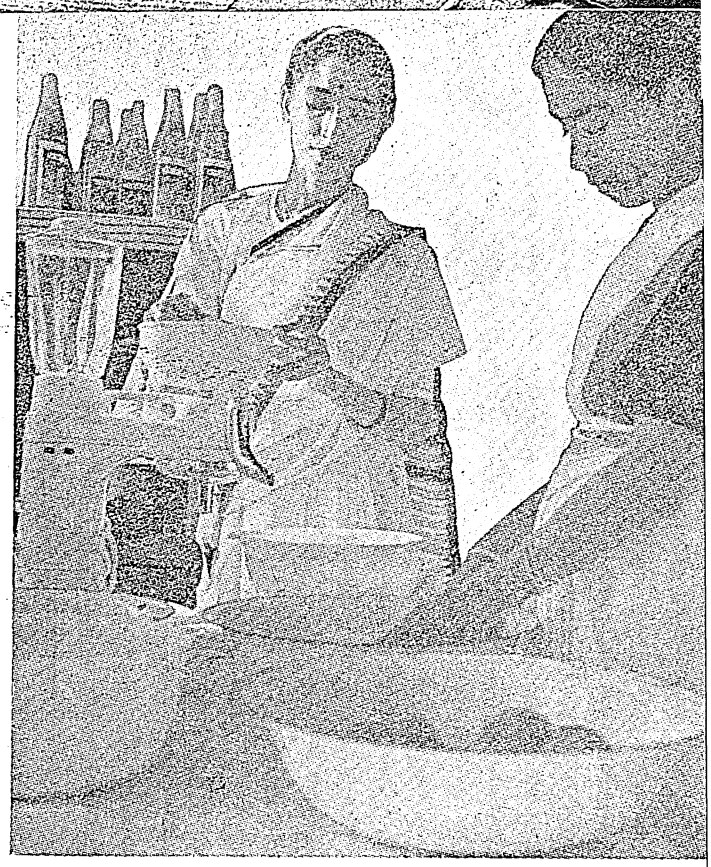
Machamma arranges the array of bottles ready to leave the factory

"We started making jams too, and found a good demand for them, but since we two had our hands full with the squashes, we have dropped that item for the time being; we will take that up soon," added Shanta.

Asked how soon was that 'soon' going to be, she replied, "as soon as we put up our own building at Nungambakam, which we are planning to."

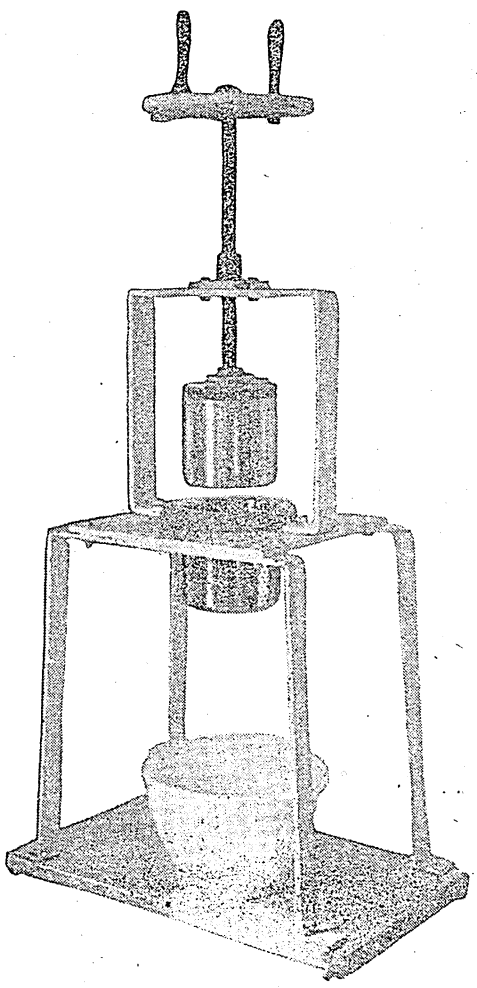
Talking about details of the products, they said they sold, on an average, 400 bottles of squashes a month, for ten months in the year, and a 100 bottles a month during the two slack months of the year.

"Our selling price is Rs. 3.25 a bottle. The pure fruit juices have to compete with synthetic juices available cheap in the market. The people at large are yet to appreciate the superiority of the fruit juice. When that day comes, fruit products in India will surely fare better," was the explanation given by Machamma.



Another day begins for Machamma and Shanta *(right)* with work at the table

The juice extractor for pineapple which the girls themselves designed cost only Rs. 20 to make



Asked what profit they made on each bottle, they said it varied between eight and 12 annas, depending on what fruit squash it was.

HIGH-PRICED MATERIALS

In the discussion on making these products cheap that followed, it came out that the girls were buying their fruits in the City itself. This naturally was costly, standing in the way of better profits. They had now approached the State Horticulturist and obtained from him a list of fruit producers from whom they intended buying their fruit requirements direct.

They had other complaints to make also. First, they thought that the licence fee of Rs. 80 was too high, especially for a small-scale venture. Secondly, the procurement of bottles was a real problem. They were costly too. Even the corks needed were high-priced. If the prices of materials could be brought down, their profits, they said, would certainly be higher.

They now appreciated the idea of marketing their products through some well-established agency. This, they said, would be necessary when they increased the output of the factory. So far, of course, they had depended on door to door sales.

I asked them this question : "Would you recommend that others follow your footsteps ? "

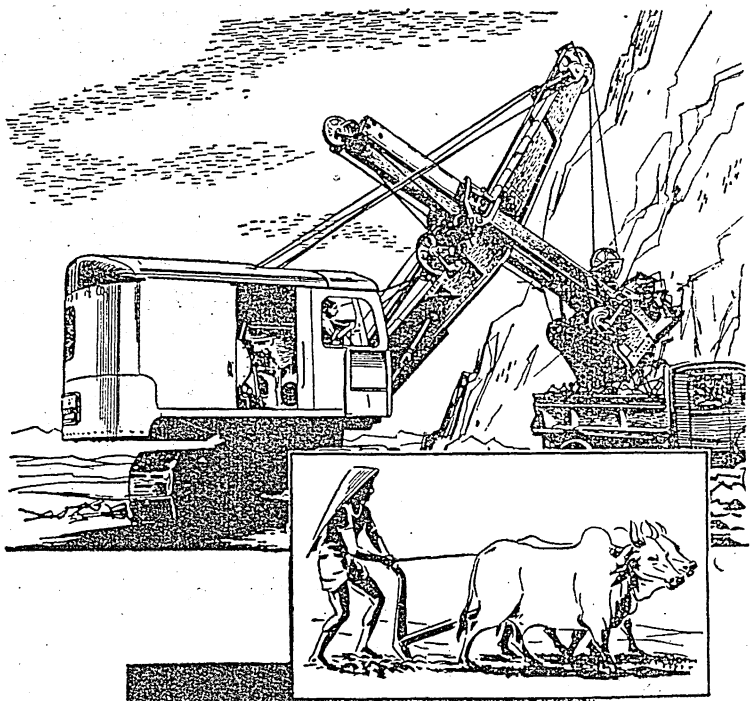
With a broad smile on her face, Shanta said, "We do ! We have found in fruit products a good hobby, an excellent profession, and, more than anything else, independence."

—K

THE EXPERIMENT THAT PAID OFF

(Continued from page 35)

Thus, I have seen that with green manure, supplemented by superphosphate and ammonium sulphate, paddy yields can very easily be increased, especially in the deltaic soils of Andhra Pradesh, and again, one need not forgo the benefit of one's pulse crop for growing a green manure crop. One can grow both and grow a better paddy crop.



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Turmeric Gets Dressed up for the Market

FROM February to April, farmers in a large number of places in India are busy harvesting an important cash crop—turmeric.

Sickles ply, cutting the dried stems and leaves of the turmeric plants flush with the ground. These are to be stored to be used as fuel when needed.

The field next gets an irrigation, and where this is not possible farmers wait for a good rain, so that the land may become soft; the plough is then worked between the turmeric rows, labourers following it to pick up the rhizomes.

Elsewhere, farmers use pickaxes instead to dig out and collect the rhizomes.

After picking, the rhizomes get a thorough washing to clean them of the sticking earth, after which their roots are cut with a knife.

These green rhizomes, weighing one to three pounds from a single plant (sometimes as much as six pounds), await further treatment.

An acre of an irrigated turmeric crop gives 16,000 to 18,000 pounds of green turmeric; the crop raised under unirrigated conditions yields 6,000 to 8,000 pounds per acre.

The green rhizomes are now sorted out into mother rhizomes and daughter rhizomes. Each plant has five of the latter, roughly, to every one of the former.

CURING TURMERIC

The mother rhizomes are reserved for seed, the daughter rhizomes are cured for the market. If the farmer decides on marketing the mother rhizomes too, then the two lots are boiled separately which is the first step in curing turmeric for the market.

Boiling is done in earthen vessels, kerosene tins or iron pans. The pan or pot or tin is filled three-fourths with raw turmeric, and equal quantities of fresh water and cow-dung poured in just enough to cover the turmeric. The mouth is covered with a lid or a gunny bag, or even dried turmeric leaves. The furnace is fed at a uniform rate.

When white vapour is seen coming out through the gunny (when a gunny is used as cover), or when a broom-stick pressed into the turmeric pierces it easily, the boiling is taken to be complete. Other indications are: the boiled rhizome is soft to feel when pressed between the forefinger and the thumb, the interior has turned yellow instead of red and the rhizome breaks easily with a little pressure.

The boiled rhizomes are next spread out in the sun for drying for a week to ten days, during which period they are turned thrice or four times to ensure a uniform drying. When the material becomes hard and brittle, the drying is complete.

The dried turmeric being full of scales and root bases, these are removed by rubbing the rhizomes on a hard surface. Some farmers wrap gunny round their feet and tread on the turmeric. The scales and root bases are next separated by winnowing.

The next step is sorting. This is done so that the produce may fetch a good price in the market. The broken pieces are defective and are separated to be used for home consumption.

POLISHING

The turmeric next undergoes polishing. This is done in different ways. Farmers in the Khond Agency of Orissa put the turmeric in long bamboo structures, usually of the shape of a small country-boat. A labourer sits at either end and polishes the turmeric by rubbing the materials against the rough surface of the structure with his legs. At a time, about 45 pounds of turmeric can be polished. In a working day of eight hours, about 4½ maunds of turmeric are polished in this way by two persons.

A second method which some farmers follow is to put the dried turmeric in big, round baskets, each of five maunds capacity. About a dozen persons with gunny wrapped round their feet rub the turmeric with them. This way, about 15 maunds of turmeric can be polished in a day.

Yet another method of polishing followed is to hang new bamboo baskets to a horizontal post with ropes tied at the rims in two places in a line passing through the centre of the rope tied. The baskets are filled two-thirds with turmeric and a few stones are also put in, and two women, one on each

side, hold the baskets and shake them up and down alternately. The turmeric is thus made to rub against the rough surface of the basket as well as the stones, and gets the polish. At a time, about 420 pounds of the cured turmeric can be polished this way.

The more common method employed by farmers is to make use of a hand-polisher for the purpose. This consists of a barrel or a drum, two feet long and three feet in diameter, mounted on an axle which passes through its centre. The axle, in turn, is mounted on two wooden poles and is connected with a handle at both ends. The sides of the barrel are of expanded metal with a close mesh which overruns the entire length of the drum which is a foot wide. This can be shifted at will. With this polisher, about 14 maunds of turmeric can be polished in a day of eight hours by two men.

Some use power polishers. These consist of four drums fitted with iron plates having holes to allow the dust to fall when the drum is rotated. Each drum can hold about 20 maunds of turmeric which takes two to three hours for polishing. Two to three annas are charged by them for polishing a maund of turmeric.

COLOURING

After polishing comes colouring. Colouring helps to give a good appearance and better finish, and is given to half-polished turmeric; it is done in two ways. The first is dry-colouring, and consists in lightly dusting a dyestuff called 'middle chrome' over a small heap of cured turmeric and mixing the same well. The second is wet-colouring. This is done by adding the colour to water and sprinkling the coloured water on cured and half-polished turmeric. After stirring the stuff well, it is left to dry for about a week before bagging it finally for export.

Wet-colouring gives a better finish than dry-colouring.

When the cured turmeric cannot be disposed of, it is to be stored.

Storing is usually done in pits 15 feet x 10 feet x 7 feet, dug in a high-lying area. After digging the pits, the sides are allowed to dry for two days. Then the bottom and the sides are thickly lined with grass and country date-mats. In each such pit, about 200 bags of turmeric are stored. After the pit is filled, the top is covered with similar packing material and finally covered with earth.

Farmers also have to store their seed material for about four months. The rhizomes in the raw stage are heaped in the shade of a tree and covered with turmeric leaves. The heap is left undisturbed till required.



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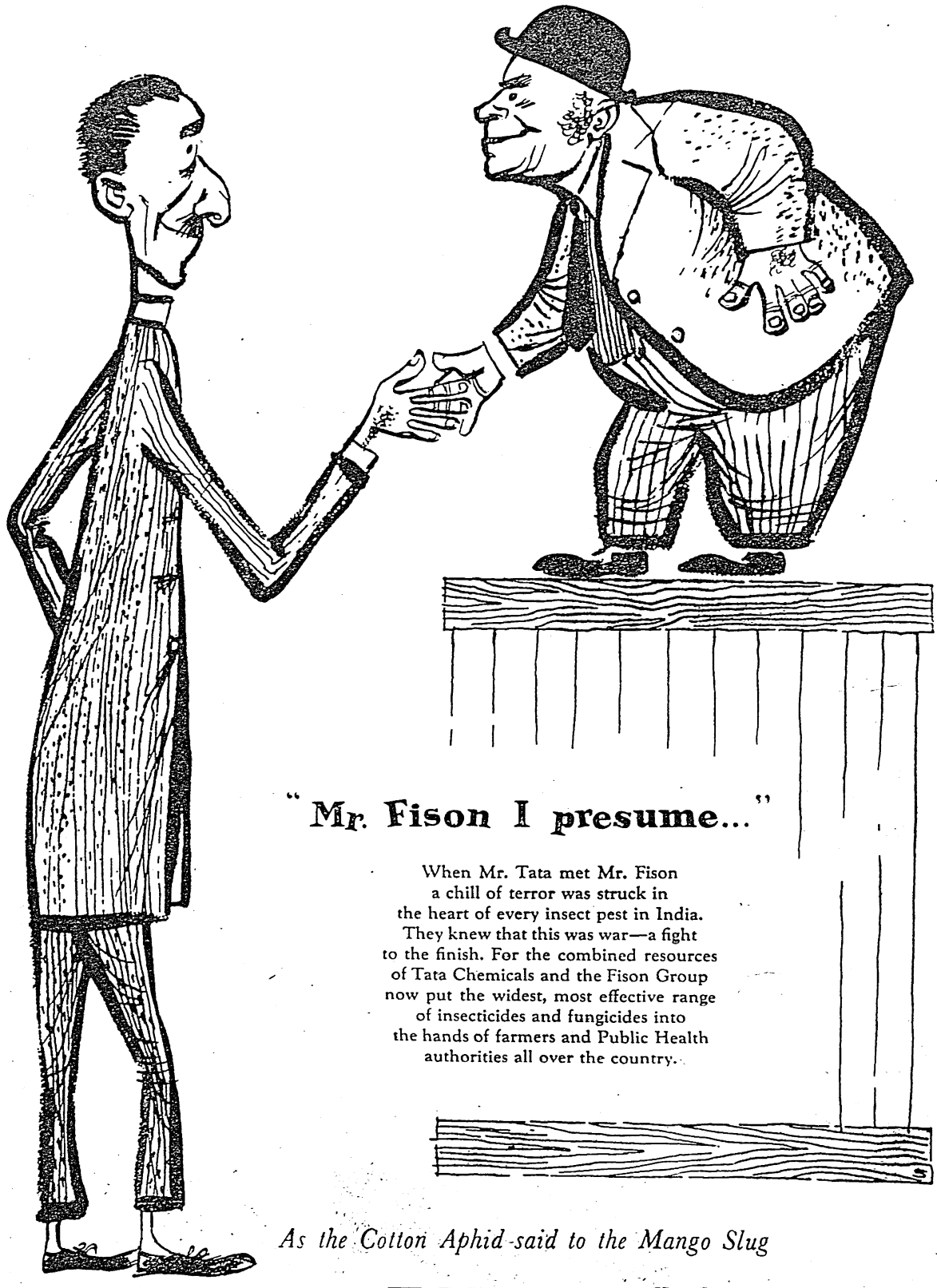
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Indian Farming

MAY 1958





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24 MAY 1958

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OUR COVER

More familiar to the farmers of the South than the North is *ragi* or *nachni* (*Eleusine coracana*) ranking third among the many millets grown. *Ragi* gives us an annual grain yield of 1·7 million tons which would be more if all farmers made use of the 18 new varieties recently evolved in Madras and Mysore

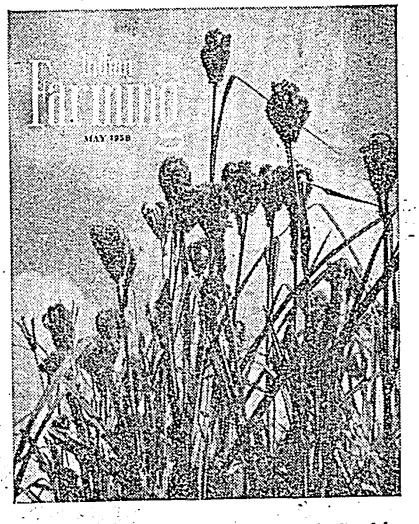


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QUICK SOIL TESTS

NO farmer can think of producing the best on his land unless he thoroughly acquaints himself with his soil.

IF he wants to keep farm production at a high level, he has to build up soil fertility and maintain it at a high level. Apart from this, he has to feed his crops at the right level of nutrition, which he can do only if he knows the manurial needs of his crops and soil.

THIS knowledge, many farmers are already aware, can be had from an analysis of the soil. Soil analysis is not new to the country, but 'rapid (or quick)' soil-testing is. It is of recent introduction.

SOIL-TESTING laboratories are being established in the various states for fulfilling an urgent need of the farmer. In the main, they will work out suitable recommendations about the application of the major nutrients (nitrogen, phosphorus and potassium) for the sample of soil sent to them.

AND now comes another development—the use of 'soil test kits'. This will help the field assistant or the progressive farmer examine the soil on the farm itself and know what nutrients are found in the soil in enough quantities and what others are to be added to it. These kits will also be useful for timely detection of inadequate or excessive application of fertilizers and for preventing their wasteful use.

IF the tests are made during the crop growth period, the farmer will also know whether he should top-dress or side-dress his crop with fertilizers for getting the best results. All this will lead to maximum production, provided, of course, other factors like water supply and cultural operations have been properly attended to, and there has not been any crop pest or disease damage.

THE Indian Agricultural Research Institute at New Delhi has recently developed soil test kit procedures suitable for Indian conditions and for adoption by our progressive farmers. These open a new era in farming aids !

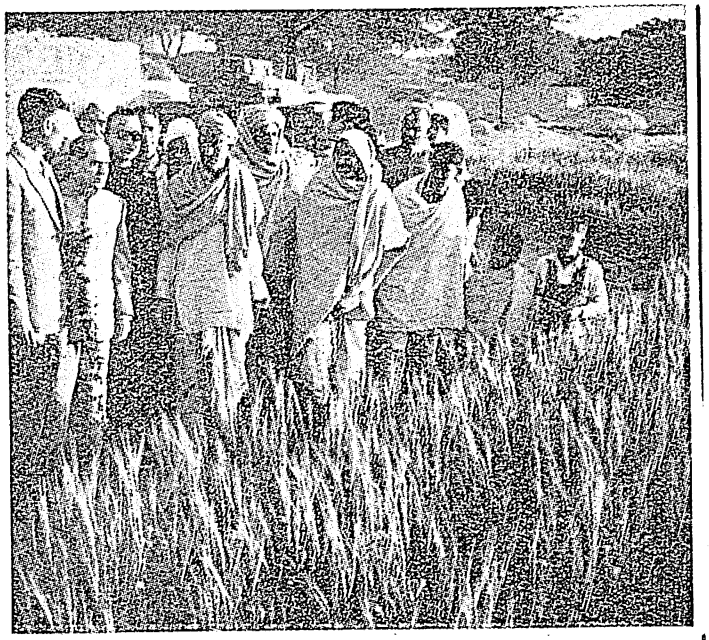
EXTENT OF EXTENSION

MORE than half of India's total rural population today has come under the benefit of the Community Development Programme, according to the latest information available.

As many as 2,152 Blocks, comprising 2,76,026 villages with a population of 150 million, are in operation as on January 1, 1958, according to the annual report of the Ministry of Community Development.

TRAINED personnel to bear the brunt of this development job include 37,036 Village Level Workers, 716 Gram Sevikas, 3,307 Group Level Workers, 3,263 S.E.O.s, 1,157 Co-operation Extension Officers and 1,811 Block Development Officers.

ANOTHER 15,465 people were undergoing training in the 255 training centres in the various states.



There were always visitors at Roshan Lal's farm

Farmers I Have Met

Roshan Lal and his 14 acres

I HAVE been meeting Ch. Roshan Lal, *Numberdar*, in Paprawat village of the Najafgarh Block in Delhi, quite often. He has been telling me an interesting story.

The story pertains to his 14-acre farm and his wheat crop, and the moral of the story is that with improvements Roshan Lal has been able to increase the per-acre wheat yield from 14 maunds to over 39 maunds, not just on one acre but as average of all his 14 acres.

The transformation came this way.

Ch. Roshan Lal got the local Village Level Worker to come and tell him about the Delhi method of wheat cultivation. He followed the method with active assistance from the Village Level Worker at all stages.

Just at the onset of the monsoon, he gave one ploughing to the land with a furrow-turning plough. He found that all the stubbles were uprooted and the soil

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inverted. Thereafter, he took out his *desi* plough and gave the field ten ploughings with it so as to pulverize the soil well. This took Roshan Lal to September. The Village Level Worker helped him next to get 14 maunds of improved seed of the variety *C. 281.* This, the farmer was told, was an early-maturing variety with grains of attractive shape and colour.

He gave the solar treatment to the seed to guard against smut. The 14 acres of land got cattle manure at 20 cartloads per acre. In addition, Roshan Lal was ready with 17½ maunds of ammonium sulphate for his wheat. Sowing was done in lines with the *pora.*

When the crop was a foot high, Roshan Lal and his labourers cleared the field of all weeds like *piazi*, *bathu* and *pohli.*

The soil being of a sandy loam type, Roshan Lal had to give five irrigations to the crop—four up to January and one in February.

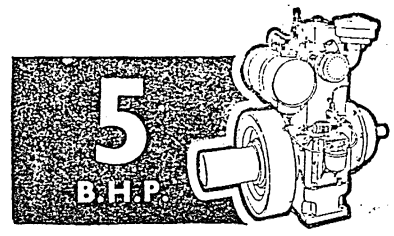
I was talking to Roshan Lal the other day and congratulating him on his farm having been considered a model farm by the Government, when he said, "Model farms are meant to tell farmers how best they can increase their farm yields. I am happy I am the first farmer on my model farm to learn about new things!"

—Anand Shankar Sharma

RESEARCH WORKERS, PLEASE !

RAFI AHMED KIDWAI MEMORIAL PRIZES

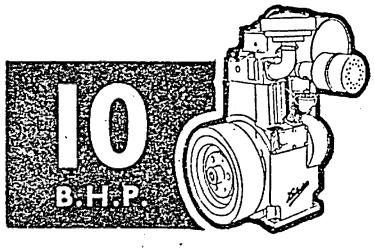
The Indian Council of Agricultural Research has instituted eleven prizes, each of the value of Rs. 5,000, for outstanding research work done in India in each of the following subjects : Agronomy, Agricultural Engineering, Agricultural Chemistry, Agricultural Botany, Agricultural Zoology (including Fisheries) Horticulture, Animal Breeding, Animal Nutrition (including Physiology and Biochemistry), Animal Diseases, Dairying and Agricultural and Animal Husbandry Economics and Statistics. The first prizes under the scheme will be awarded for the research work done, either individually or jointly, during the calendar year 1957, i.e., from 1st January to 31st December, 1957. The last date for receipt of applications is 30th June, 1958. Further particulars about these prizes and a copy of the prescribed application form can be had from the Additional Secretary, Indian Council of Agricultural Research, Queen Victoria Road, New Delhi-2.



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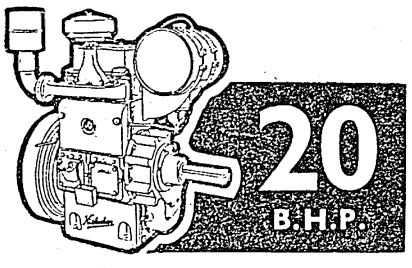
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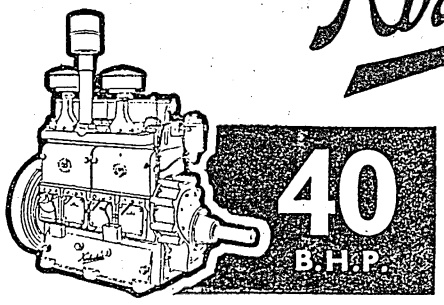
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Man of the Month

a hybrid yields a hundred maunds !



by **M. G. Kamath**

LAST year when the maize crop was ripe for harvest on Shri Jagir Singh's 2½ acres in Kanthala village near Chandigarh, the villagers are reported to have said, "Jagir Singh's 2½ acres will yield more cob than the whole maize area in the rest of the village put together."

And, as if to keep up that expectation of theirs, Jagir Singh harvested 100 maunds 12 seers 7 *chhataks* of shelled cobs to the acre ; the other farmers, their usual 20 maunds.

The difference in yield was mainly due to the fact that Jagir Singh was wise enough to go to the nearby Government Hybrid Seed Farm and buy hybrid maize seed, while his neighbours sowed the usual *desi*.

This was not the first year that Jagir made his neighbours gape at his bountiful crop. The year before also he had grown the hybrid and had obtained 78 maunds 13 seers to the acre. But that time he had grown the hybrid only on an acre, to give the "much-talked of seed" a trial.

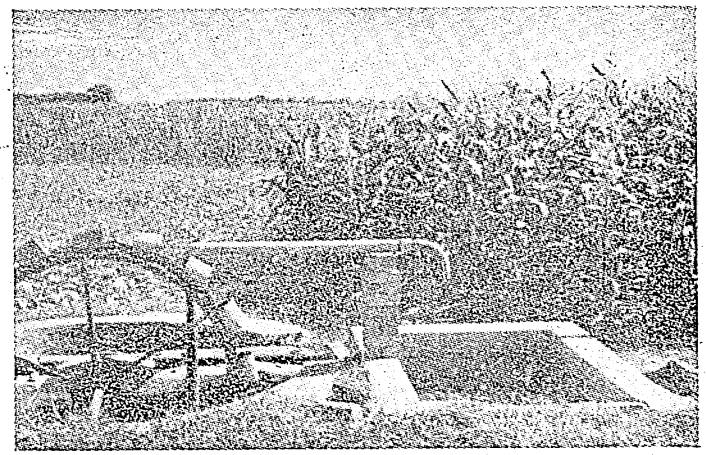
Nirmal Singh Gill, in charge of the Seed Farm in Chandigarh, who introduced me to Jagir Singh, told me that the first year the farmer had been given Hybrid *U. S. 578* seed, and the following year Hybrid *Kansas 1859*. Both the years, Government wanted to see how the American hybrids fared on Indian soil.

NOT BEYOND HIM

Jagir Singh was careful enough to ask the Seed Farm Manager what special care the hybrid needed to produce the high yields for which it was famed, found it to be nothing beyond him.



The crop is maturing and Jagir Singh has to get ready for harvest



The Persian wheel and the pump dominate the scene on the Kanthala farm

He raised his first year's hybrid maize crop thus.

In the third week of June, he gave the land three good ploughings, applied 20 cartloads of cattle manure and two bags of ammonium sulphate an acre.

In the last week of the month, he planted the seed at six seers to the acre, used ropes to get straight lines, and used the "corn planter" for sowing.

He saw to it that each hill got three seeds, gave a spacing of two feet between hills and $2\frac{1}{2}$ feet between lines.

Depending on rainfall received, gave two hoeings with the *khurpa* and one more with the hand hoe.

With the second hoeing, applied the second dose of fertilizer—two bags of ammonium sulphate—as a side-dressing.

His Persian wheel rolled out two good irrigations to the crop in August-September.

With this much of care, the first crop rewarded him with over 78 maunds of cobs on that acre.

"But I heard later that another farmer in Ambala had beaten me hollow by producing 90 maunds with the same seed," explained Jagir Singh, "and I said to myself that I should beat his record next."

THE SECOND ATTEMPT

So he went in for the hybrid seed again for a larger area—$2\frac{1}{2}$ acres on his eight-acre farm.

And to this second crop, he gave a closer spacing of $2\frac{1}{4}$ feet $\times$ $1\frac{3}{4}$ feet. I asked Jagir Singh why.

His reply was, "to have a greater plant population per acre ; with such good manuring that was to be done, I felt that more plants per acre would be all right."

NOT IN ITS "BLOOD"

I asked Jagir Singh whether with an equally high manuring would not the *desi* also yield high. To this his answer was, "...I have tried good manuring for my *desi* maize, but the only thing it did was to grow fat and lodge !" He was convinced that the capacity to yield high was not in its "blood".

Jagir Singh then ventured to tell me of the conclusion of his two-year experience with maize.

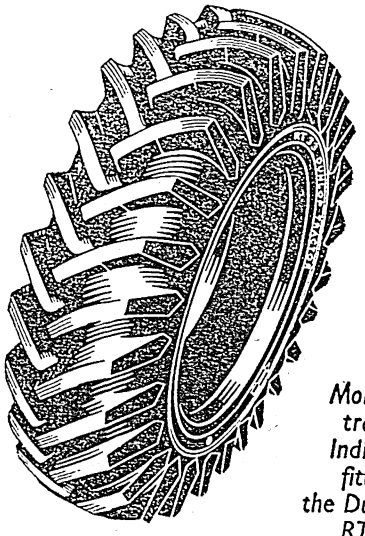
"Good crop-yields in our area depend on fertilization, irrigation and good soil management. Though our farmers do the last one satisfactorily, they tend to neglect the first two."

Nirmal Singh summed up how hybrid maize has been performing in the State :

Pure U. S. hybrids have given an average of 60 maunds on Punjab farms as against the 20-maund average of the *desi* variety. Now we are producing some Punjab hybrids, and trials with these show that the average yields can go up to 50 to 55 maunds per acre.

"I work my tractor hard, especially in the busy season..." This is a typical comment from farmers anxious to get the most out of their machines. Their work becomes easier with the Dunlop RT 33 open centre tractor tyre. This tyre has more tread bars to give greater grip on hard, dry soils; it reduces power loss on the tractor and enables a greater acreage to be ploughed per day.

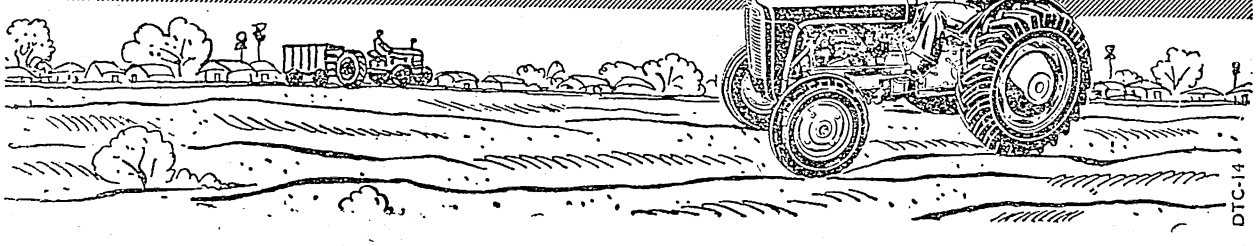
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DTC-14

CARE FOR CASHEWNUT ?

by

U. Narasinga Rao

and

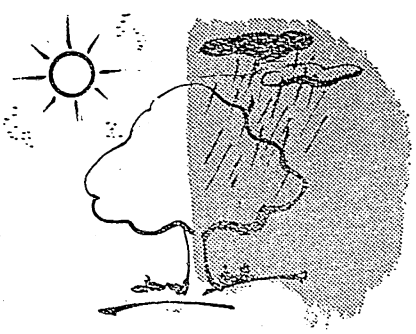
N. V. Madhava Rao

Agricultural College and Research Institute

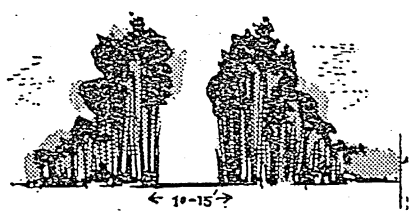
Coimbatore

THERE is a good demand for cashewnuts. Those who intend growing the crop can get good profits if they pay some thought to the basic facts about the crop.

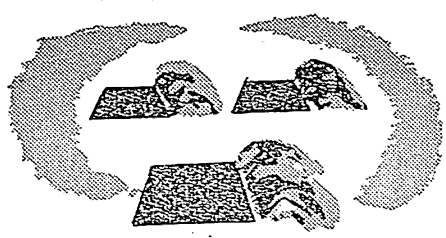
You can grow the cashew under varying soil and climatic conditions : from the sandy sea coast to the lateritic hill slopes of the West Coast, up to an elevation of 2,000 feet above sea level, and in regions receiving an annual rainfall of 25 inches as well as in those with over 120 inches, as in parts of Kerala and Mysore States. Avoid heavy clay soils or regions subject to frosts ; the cashew does not grow well in these places.



If you want to break up forest regions for cashew planting, clear the scrub growth first. In doing so, avoid 'clear-felling' the wild vegetation which will lead to erosion of the surface soil by rain and wind. It would be good to clear the scrub in strips ten to 15 feet wide, leaving an uncleared strip adjoining to check soil wash. If you erect large contour bunds, these will help conserve not only the soil but also the soil moisture.



Next, dig pits ($1\frac{1}{2}$ feet × $1\frac{1}{2}$ feet × $1\frac{1}{2}$ feet), roughly about two months in advance of the sowing season. The pits may be 20 feet apart if the soil is moderately fertile ; adopt a wider spacing in richer and sandy soils where the trees tend to spread.



In some forest plantations in Madras State, a spacing of 33 feet between rows and $16\frac{1}{3}$ feet between trees has been adopted. In course of time, it will probably be necessary to thin out every other tree in the row in these plantations to avoid crowding.

Allow the pits to weather for at least a month before the sowing of the seeds. About a fortnight before the date of sowing, refill them, adding, if possible, ash, burnt earth and rotted cattle manure.

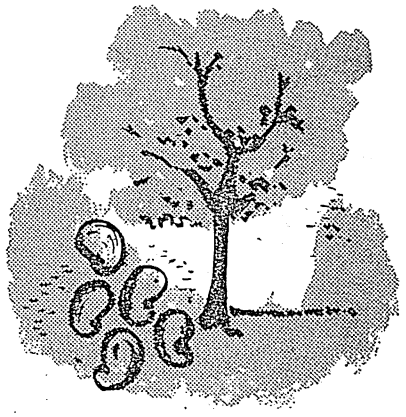
With a few summer showers, the contents of the pits settle down and are ready to receive the seeds.

An alternative method of preparing the pits would be to dig two cross-trenches three feet long, one foot wide and a foot deep. Collect the scooped out soil in the form of a mound at the point of the intersection. Sow the seeds in the centre of this mound. The side-trenches will serve as excellent traps for conserving moisture.

SELECTING THE SEED

Collect seeds from vigorous and healthy trees bearing regular and heavy crops of medium-sized nuts. Don't go in for seeds from the market or factories, even though they may look fresh and good. Their parentage will be unknown, and you will never be sure how they will turn out when they grow up into trees.

Select seeds from the current year's crop to get good germination. It does not matter whether they are collected at the beginning or at the end of the season.



In some parts of Malabar, people believe that seeds not fully mature are to be preferred to the hard, ash grey, fully mature seeds. This is not true. Experiments at the Central Cashewnut Research Station, Mangalore, show that it does not matter at what stage of maturity you collect the seed.

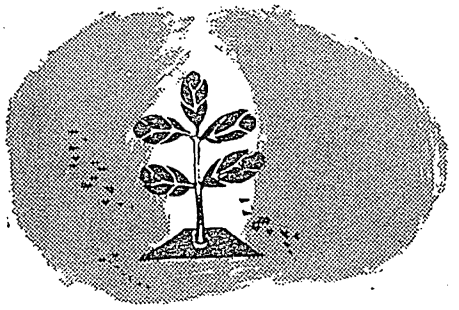
However, medium-sized nuts, about 60 to a pound, germinate best. Prefer seeds which sink in water to the lighter ones which float.

SOWING THE SEED

Seeds sown with the stalk-end up and slightly inclined germinate best and produce seedlings with straight stems. In certain positions, when the seed germinates the cotyledons are pushed out above the soil along with the plumule. These cotyledons are sweet and fleshy, and birds, squirrels and other rodents, monkeys and jackals feed on them. In the upward slanting position, however, only a few seeds will have the cotyledons exposed, and, hence, this position is to be preferred.

Sow the seeds two or three inches deep to get the best germination. You can sow two or three seeds per pit to allow for failures. The seeds germinate in 15 to 20 days.

At the end of two months, thin out the surplus seedlings, leaving only one vigorous seedling per pit. In places where damage from pests is feared, provide thorn enclosures.



PLANTING THE SEEDLINGS

The cashew is usually raised only by seed. Planting of seedlings is rarely practised. However, in some forest areas where damage by pests is very severe, the seedlings are raised in advance in small bamboo baskets and set out as such during the planting season.

On a large scale, however, this method may prove both costly and less successful, as the cashew is a plant which resents any disturbance to its root system. If, for some special reasons transplanting is essential, it



may be successfully done if the plant is cut back to a half or two-thirds its height at the time of lifting from the beds and prior to potting.

PLANTING LAYERS

Planting vegetatively propagated plants, such as layers and grafts, is better than sowing seeds. The behaviour of seedlings cannot be guaranteed, but layers will have the same characters as the parent tree had.

Among the several methods of vegetative propagation tried at the Central Cashewnut Research Station, the one known as 'air-layering' by cincturing has proved to be the best.

This consists in removing, from a selected adult, bearing tree, a ring of bark 1/8 to 1/4 inch thick, from a terminal shoot of the thickness of a pencil. Twine is wound round the exposed cut to prevent the exposed edges of the bark from healing over. Moist moss or wood shavings are placed over the cut and a piece of 'Alkathene' ('Polythene') film, about six inches long and five inches wide is then wrapped round it. The

ends of the film are brought together at the bottom and top, and secured. This film retains moisture for long periods, and subsequent periodical watering of the layered portion will not, therefore, be necessary.

Forty-five to 60 days later, roots are formed at the ringed portion. At this stage, a V-shaped cut is given at the lower end of the treated shoot, and a fortnight later the cut is slightly deepened. The rooted shoot is finally separated from the tree a week later.

The total period taken from the time of layering till separation is roughly 75 days. At the Cashewnut Research Station, the layers prepared in March were ready for separation within 45 days. The best results were obtained between February and April, which is a desirable feature, because the layers raised in this period become ready immediately after separation for planting in June and July which are the ideal months on the West Coast for planting.



The cost of production per layer works out to two to three annas. Direct planting of such layers soon after separation from the parent trees was also found possible. This method, which is successful under the West Coast conditions, is yet to be tried on the East Coast. The planting of layered plants may be done as with seedlings in pits $1\frac{1}{2}$ feet $\times$ $1\frac{1}{2}$ feet $\times$ $1\frac{1}{2}$ feet.

Grafting on a large scale by inarching is also possible. The cost of production of such grafts can be considerably reduced by employing plastic containers.

AFTER-CARE

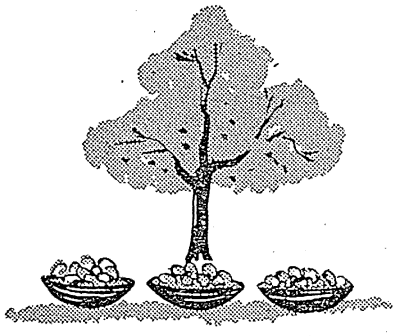
Confine interculture to a surface scraping of the soil and only for such distinct purposes as weeding or working in of compost. Avoid deep cultivation. You can provide leaf mulches in the tree basins for lowering soil temperature and conserving moisture in summer.



The cashew is rarely manured. Soils on which this crop is grown vary in fertility. In virgin soils, manuring may not be necessary. Where facilities exist, the cleared vegetation may be converted into compost on the site and utilized for surface dressing once a year during the monsoon rains.



Harvest only fully mature nuts which have a hard, greyish black outer shell. Picking of immature nuts lowers their market value.



YIELD AND INCOME

The trees fruit even in the third year, though normal bearing may commence only in the tenth year. The trees bear good crops for nearly 30 years, after which they begin to decline. It should be easy for you to obtain 50 pounds of nuts per tree under proper selection and good management. Individual trees yielding over a 100 pounds are not unknown, both on the East and West Coasts of South India. The prevalent price for raw cashewnuts is very attractive. In 1956, it ranged between Rs. 825 and 917 per ton. A well raised plantation should yield a ton of nuts per acre.

At present, 'cashew apples' are mostly wasted. You can make syrups, squashes and candies out of them. The processing of nuts is carried out in factories on the West Coast. The raw nuts are roasted prior to shelling.

Improved methods have been tried recently to recover the cashew shell oil which is greatly in demand for industrial purposes. On the East Coast, establishment of processing factories may foster a greater interest in cashew cultivation.

D AGRICULTURAL

IN SEARCH OF AN INFORMATION SERVICE ?

The Indian Council of Agricultural Research issues a large number of publications each month for the benefit of farmers, Village Level Workers and agricultural students. These publications cover a wide variety of agricultural subjects of interest to you.

Here are a few of the Farm Bulletins issued in English :

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PESTS

The cashew tree is subject to several pests and diseases, of which the following are important.

Root and stem borer. The larvae of this dreaded pest bore into the trunk and roots, resulting in the death of the tree.

Removing the grubs at an early stage, spraying of the basal portions of the tree trunk and root with BHC 0·1 per cent (a pound of BHC wettable powder in 6¼ gallons of water) and filling the bore holes with the spray liquid are some of the control measures.

Thrips. The leaf thrips are minute insects which suck the leaf juices and, in extreme cases, the leaves show a scorched appearance. The pest can be controlled by spraying BHC (0·05 per cent) or 'Folidol' (one ounce in 12½ gallons of water).

Leaf miner. This damages the leaves by tunnelling through the tissues. Spraying with 'Folidol' checks the pest.

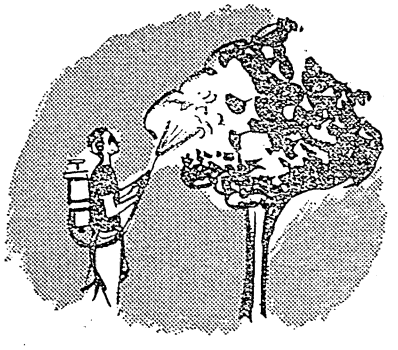
Tea mosquito. The tea mosquito causes the drying up of the tender shoot tips by the punctures it makes. DDT 0·1 per cent spray (a pound of five per cent wettable powder in 50 gallons of water) controls the pest.

Other pests include the sporadic leaf-eating caterpillars, leaf webbers, flea beetles, mealy bugs and scales.

DISEASES

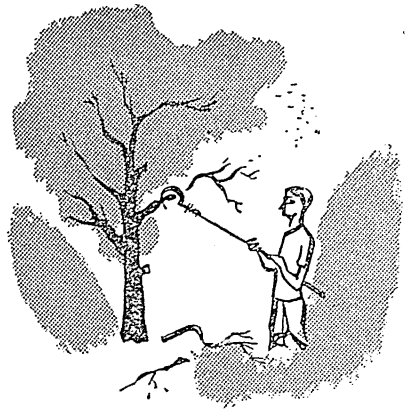
Die-back. Also called the 'pink disease', this is a serious disease, especially along the West Coast. Its control consists in pruning the affected branches just below the affected portion and spraying with one per cent Bordeaux mixture (five pounds of copper sulphate plus five pounds of lime in 50 gallons of water).

Powdery mildew. Powdery mildew, appearing during the dry weather, affects the tender leaves and the inflorescence. Dusting with fine sulphur controls the disease.



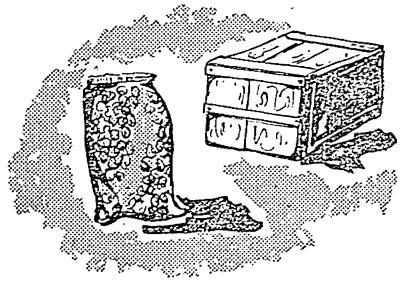
The apple rot, spotting of nuts and shoot-drying have also been noticed in the cashewnut.

Removal of dead twigs and trees periodically and attention to general orchard hygiene can check the incidence and spread of several of the maladies affecting the crop.



MARKETING

At present, no systematic marketing methods are being practised. The trade is mostly in the hands of itinerant merchants and a host of middlemen. This unregulated method of disposal of produce results in considerable loss to both the producers and consumers.



The Government of India and State Governments are taking steps to overcome the several disadvantages in the existing methods and to bring in 'regulated' markets as in other commercial commodities. Steps are also being taken to explore the possibilities of finding new markets in Europe, the U.S.S.R., China and other countries, besides the traditional markets of the United States of America and the United Kingdom.

Your Questions and

Suggestions are Welcome !

Address them to the Editor, "Indian Farming",

Indian Council of Agricultural Research,

Queen Victoria Road, New Delhi-2

TIME YOU SOWED COTTON AT THE RIGHT TIME

WHAT is the best time for sowing American cottons in the Punjab? What is the best fertilizer for the crop?

Answers to these two questions were found after five years' experiments at three research stations in the State.

The experiments were conducted at Abohar, Hansi and Jullundur, representing the three main cotton-growing tracts of the Punjab.

At Hansi and Abohar, the soil was fine sandy loam and at Jullundur, sandy loam. The climatic conditions are humid at Jullundur and dry at Hansi and Abohar. The varieties grown for the experiments were *320F* at Abohar and Jullundur and *216F* and *H14* at Hansi.

In these experiments, by sowing cotton early, higher yields were obtained at all the three stations, the optimum sowing time being the whole month of May for Abohar, the second week of April to the second week of May for Hansi and the second week of April to the first week of May for Jullundur.

INTERESTING OBSERVATIONS

Some interesting observations were also made in these experiments. When the crop was sown early, it showed a better growth due to the longer and warmer growth period available to the plants, and the crop could make a better use of the nitrogenous fertilizer (in this case, ammonium sulphate) applied.

As the sowings were delayed, the plants' ability to make the full use of ammonium sulphate also decreased. The experiments also showed that the plants could make a better use of nitrogen in the drier areas than under humid conditions.

As regards spacing, a closer spacing gave a higher yield at all the three stations, especially when the crop was sown late.

Early sowing was also found to have other benefits. An early-sown crop could be given one or two intercultivations (dry cultivations) before the monsoon set in. This was useful in keeping weeds down. An early-sown crop is not attacked by the leaf roller and jassids to the same extent as a late-sown crop is.

Nitrogen is the most important factor in increasing the yield of cotton under irrigated conditions in the Punjab. This can be supplied in the form of organic manures, green manures or chemical fertilizers. As organic manures such as cattle manure and compost are not available in sufficient quantities, chemical fertilizers are commonly used. Formerly, Chilean nitrate and ammonium sulphate were widely used for fertilizing cotton. Now other fertilizers like urea, ammonium sulphate nitrate and calcium ammonium nitrate are being made available to farmers.

FERTILIZER TREATMENT

At the three research stations, experiments were conducted to find out which would be the best fertilizer treatment for cotton. For the experiments, ammonium sulphate, a mixture of ammonium sulphate and groundnut cake (on a half and half nitrogen basis to supply 50 per cent of the nitrogen) were compared.

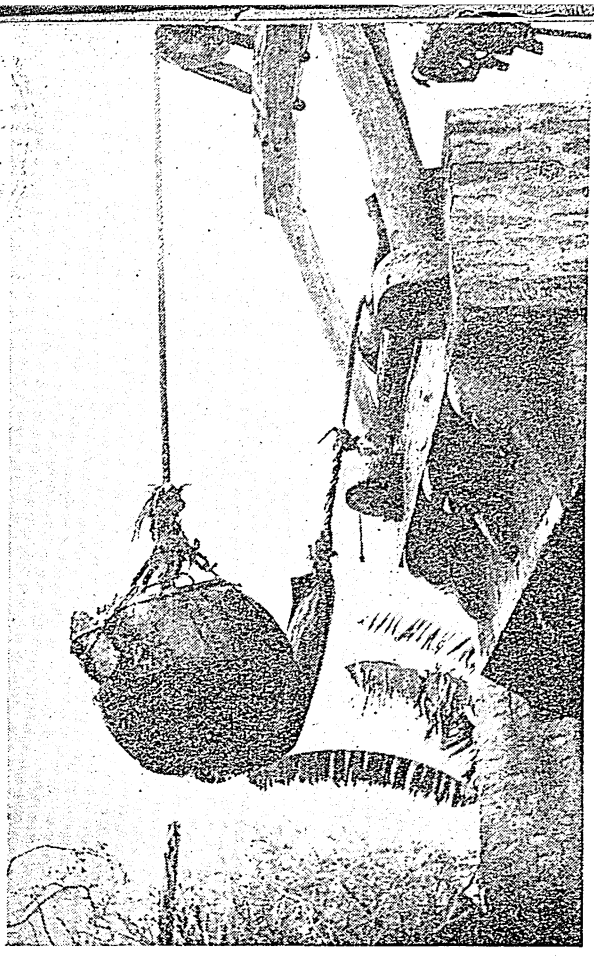
On an equal nitrogen basis (50 pounds and a 100 pounds), it was found that ammonium sulphate gave the highest yield, the mixture of ammonium sulphate and groundnut cake, the next best, and groundnut cake alone, the lowest. Ammonium sulphate is, therefore, the better source, the most efficient and the cheapest.

Cattle manure, on the other hand, gave but comparatively low yields. The different nitrogenous fertilizers such as urea, ammonium sulphate nitrate and calcium ammonium nitrate gave similar results, showing thereby that the farmer could make use of any of them instead of ammonium sulphate. He can thus choose that fertilizer which costs him the lowest per pound of nitrogen.

The nitrogenous fertilizer when applied to cotton also showed a residual effect on the succeeding wheat crop. An application of 50 pounds and a 100 pounds of nitrogen (in the form of any of the nitrogenous fertilizers) to cotton gave an increase of 1·5 and 3·3 maunds, respectively, of wheat grain per acre, thereby showing its residual effect on the succeeding crop.

SOME THINGS TO KNOW ABOUT IRRIGATION

by
C. K. Ashdhir
Assistant Irrigation Adviser
Ministry of Food and Agriculture
Government of India



An ancient device for drawing water from the well—the *charsa*

IN recent times, many Indian farmers have taken a big stride in the use of a more modern device than the leather *mhote* or *latha* or Persian wheel for lifting water for irrigation. This device is the pump which has become quite popular with the farmers, helping them improve their crop production.

Pumps used for lifting water for irrigation are either the centrifugal (horizontal) pump or the deep well turbine pump. Both work on the same principle but differ in the way they convert the velocity energy into pressure energy.

The horizontal type pump is fitted on a base plate as near the water-table as possible, and the 'driver' is either directly coupled with it or placed in another place from where it can be connected to the pump by a belt drive.

In the deep well turbine type, the pump unit is suspended by column pipes, and the driving shafts are brought up to the top at ground level to be connected suitably to a driver. This type is used on tube-wells or where the pump can be suspended under water or where the depth of the water-table is over 20 to 25 feet.

HORIZONTAL CENTRIFUGAL PUMPS

It is the horizontal centrifugal pump that is largely used in our rural areas for lifting water. The pump is simple in construction and operation. However, to get the best results with it, certain important points in its installation, operation and maintenance should be remembered by every pump owner.

The pump should always be fitted in such a way that the water lifted is not more than 15 feet from the centre line of the pump. It is the atmospheric pressure at the place where the pump is installed that governs the maximum suction lift of any pump. This maximum lift can be nearly 33 feet at sea level. Pumps are generally designed for a suction lift of 15 feet and, hence, should be installed in such a way that the water-table is near about 15 feet from the pump centre when the pump is working. Only then will the pump deliver the water at a most economical cost. If it were to operate at a higher suction lift, its efficiency would be lowered and its running will not be economical.

The foundation on which the pump is installed should be sufficiently strong, so that it may provide a good support for the base plate, and also absorb in the vibrations produced.

Align the pump and the driver. If this is not done, it will have a bad effect on the life and day to day performance of the pump-set.

Support the suction and delivery pipes independently, so that the pump is not strained when these are fitted to it.

It is a good rule to follow the manufacturer's instructions.

Treat the pump humanly by using your common-sense, so that you may get the maximum out of it. Pumps may be driven by either an electric motor or a diesel or petrol or powerine oil engine.

An electric motor is cheaper in cost, maintenance and operation. It needs a smaller space and is easy to run and control. It is economical to run the pump with an electric motor wherever electricity is available.

There is one more benefit from electric motors. They do not need much skilful or efficient handling as the petrol, diesel or other internal combustion engines do.

Many farmers use diesel engines. Petrol and powerine engines are also used, but to a limited extent because of the higher running costs involved.

HOW TO DISTRIBUTE WATER

After the water is brought to the field head, the farmer needs this water to be taken to the place, at the time and in the quantity required by him for the needs of his different crops. While it is possible to supply the water at the given place, the other two things the farmer has himself to ensure by adopting such a system of irrigation that he makes a full use of every drop of water that has been lifted.

Where the farmer gets his irrigation water supply through canals, outlets form the most important part of water distribution. The outlet is a device at the head of a watercourse which connects it with the distributing channel. The optimum capacity of an outlet is the discharge which the farmer can handle efficiently and without losing much water through absorption. The outlets vary in size, depending upon the requirements of individual farmers.

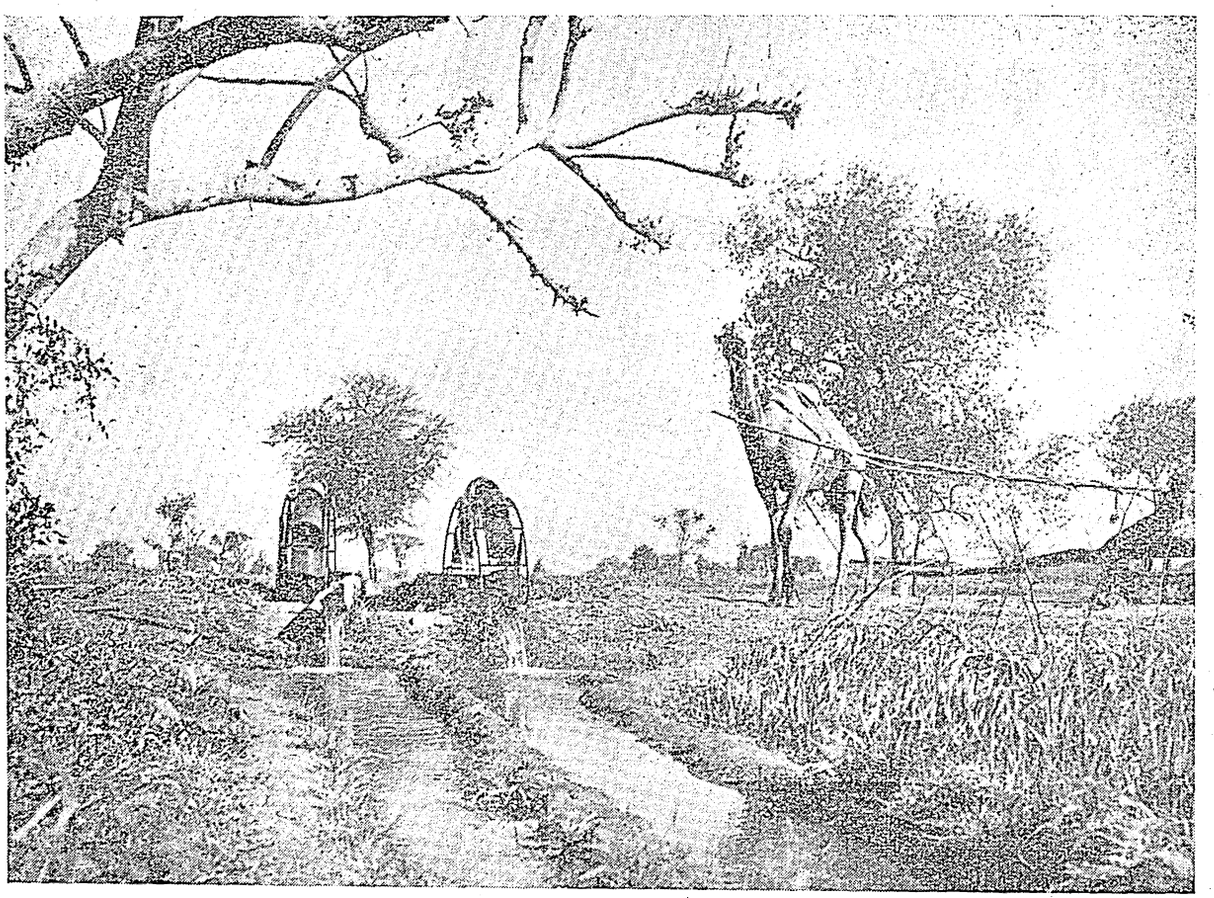
Furrow-crops can be conveniently irrigated with syphon tubes. These are curved pipes of metal, plastic, rubber or hollow bamboo, and enable the farmer to syphon water from the watercourse to the furrows in a controlled manner. The tubes are very light in weight and can be easily carried from one place to another.

THE GATED PIPE

Farmers can also make water application to their furrow-irrigated crops more uniform by frequently regulating the size of the stream flow into the furrow. For this purpose, the gated pipe is helpful. The gated pipe is commonly used for row-crops in countries like the U.S.A. and Australia.

The gated pipe is a modified metallic pipe, mostly of aluminium, having rectangular openings which are fitted with sliding metallic gates. The gates are spaced according to the centre to centre distance of the furrows. The flow of water can be adjusted with these gates from one gallon per minute to as many as ten gallons per minute or more. For a proper use of the gated pipe, the field and furrow have to be accurately sloped.

The Persian wheel still remains the most popular mode of irrigation in Indian villages





Spray irrigation ...



... and use of the gated pipe

The gated pipe, however, is yet to be tried in this country.

Spray irrigation or applying water to the surface of the soil in the form of a spray, though popular in many other countries, is yet to be tried in India. At present, its suitability for irrigation in our country is under experiment.

For highest crop yields

USE "KISAN" BRAND

GROUNDNUT & MOWRAH CAKES

★ HIGH NITROGEN CONTENT

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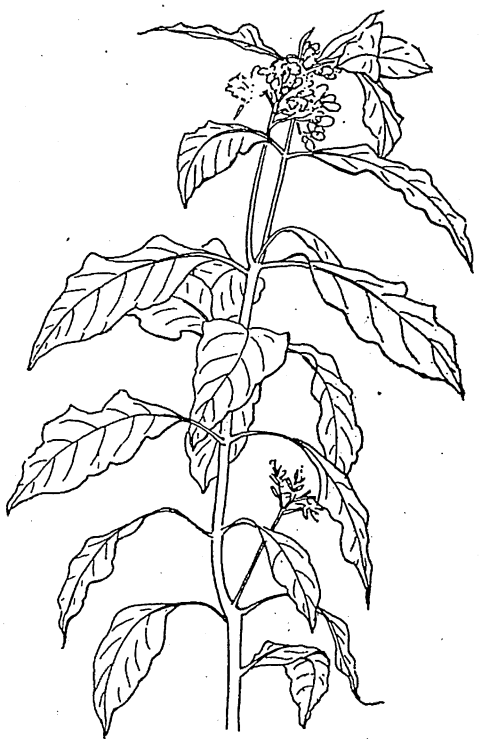
PRAG OIL MILLS

ALIGARH

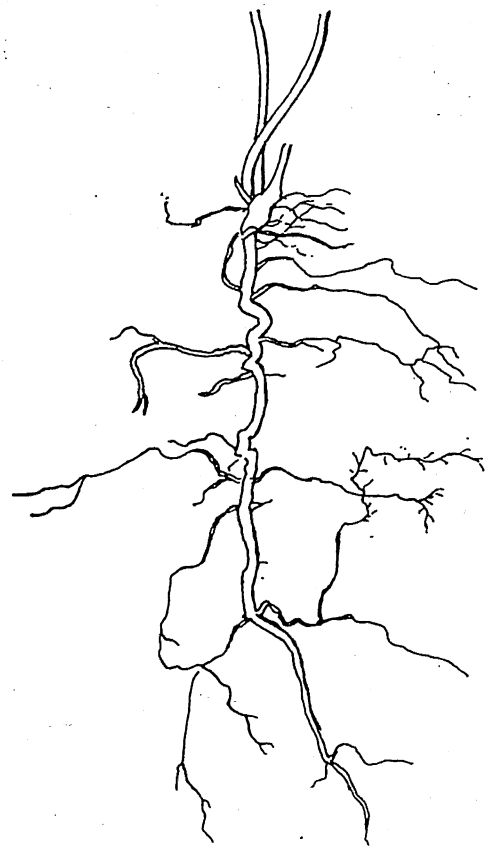
This wonder drug, Rauwolfia

by

S. Meenakshi



A *Rauwolfia* shoot



Roots of *Rauwolfia*

THE world has found a wonder drug in *Rauwolfia* root, the root of *Rauwolfia serpentina.* Widely used as a sedative and in the treatment of hypertension (blood pressure), India is the main supplier of the drug.

Flourishing in a hot, humid climate, *Rauwolfia* finds a deep sandy loam or a sandy loam soil best for a good growth of its roots. Though the plant thrives in loamy soils too and also in red laterite loamy soils, heavy clay soils are not found suitable for the production of roots.

The plant can be successfully cultivated in the open or under partial shade under irrigated, as much as unirrigated conditions. If irrigation is not available, the plant can as well be grown under the shade of a tall or medium-sized tree.

At the Forest Research Institute, Dehra Dun, where experiments on raising the plants from seeds, stem cuttings and root cuttings are in progress, they have found that the total roots including thick, thin and fibrous roots from a year-old plant raised through seed, yield about 6½ times the quantity of the roots produced by plants raised from stem cuttings and 3½ times those from plants grown from root cuttings.

FROM SEED

Hence, if the roots are to be produced on a commercial scale, it is best to raise the plants from seed. In Madras State, it has been seen that with 30 to 33 per cent germination about five pounds of seed is required to plant an acre, giving a spacing of one foot × two feet. To sow this much of seed, a five-cent nursery (1/20 of an acre), including water-channels and bunds, would be needed.

Thick sowing is not recommended as the seedlings have a long root system growing vertically down to the soil which would be injured when lifted, if sown thick.

It is true, however, that it is difficult to get enough seed from natural sources. The only way out is to raise the plants vegetatively in compact areas and collect the seeds from these.

Ripe seeds can be collected from June to October. The seeds should be stored in air-tight tins so that they may remain viable for about six months.

VEGETATIVE WAYS

For vegetative propagation, you can plant shoot cuttings with about half an inch of root by May-June, though you can extend this up to July. Cuttings strike roots in a week, and put up a luxuriant growth and produce flowers quickly. Roots are formed in four to five months. Up to 90 per cent success can be had if selected branch cuttings of the thickness of a pencil are treated with

(Contd. on page 40)

WHAT'S NEW IN FARMING

CABBAGE SEED PRODUCTION

THE 'stump' method of producing cabbage seed has been found successful under conditions in Kalimpong, West Bengal.

The stump method consists in raising seed from decapitated stumps of cabbages, as against the common Head Incision method which consists in giving the cabbage head two vertical cuts at right angles from the top without injuring the bud.



By the stump method, about 2½ ounces of seed per plant could be produced. The seed also could be produced in a shorter time.

Another advantage in this method is that since the heads after decapitating could be marketed, it added to the producer's income.

YELLOW LEAF DISEASE

PRELIMINARY trials at the Central Arecanut Research Station in Vittal (Mysore State) show that it is possible to control mites which cause the yellow leaf disease in arecanut palms.

This is done by either spraying wettable sulphur (an ounce in two or three gallons of water) or 'Folidol' (2 c.c. per gallon of water), or dusting lime plus sulphur (2 : 1).

In spraying or dusting, however, the lower surfaces of leaves which harbour the mites are thoroughly sprayed or dusted.

The spraying or dusting may start in early December when the mites



start breeding and repeated, if found necessary.

The yellow leaf disease goes by such names as *chovakedu*, *karimputhal*, plague, *vasantha*, *kattu* and the leaf disease, and is marked by trees having pale yellow leaves and drooping crowns. The tiny mites have been found to cause the disease.

Due to the disease, the yield of the trees goes down.

DISINFECTING THE SEED

DISINFECTING of cotton seed with an organic mercurial compound before sowing is being recommended as a method of controlling the anthracnose disease of cotton.

The disease appears in the Khandesh area of Bombay State in a serious form in years of heavy rainfall. It causes seedling blight in the early stages, and if the humidity is high at the time bolls are formed causes boll rot.

As a result, yields go down and the quality of the *kapas* also is spoiled.

The seed can be disinfected by dressing it with the organic mercurial compound in a revolving drum, or by besmearing the seed with a mud paste to which the disinfectant has been added.

Two ounces of the mercurial compound will have to be used for every 15 pounds of the seed.

Thinning the crop at the time of the second interculture is considered a good practice in checking the disease.

As a preventive against the disease, the crop in the boll-forming stage would also have to be sprayed with a copper compound twice or thrice in September.

It is also essential, it is pointed out, to avoid cotton after cotton to prevent infection of the disease from one cotton crop to the other.

The Mango

An outstanding book on mango-king of Indian fruits, it presents a graphic description of every known variety of the fruit ; price, Rs. 40.

The Grassland and Fodder Resources of India

This monograph, the result of a special study undertaken by the Food and Agriculture Organisation, contains detailed information relating to grassland and fodder resources of India ; price, Rs. 16.

Agricultural Research in India (Institutes and Organizations)

The book contains an exhaustive account of all the research institutes and organizations connected with agriculture and animal husbandry in India ; price, Rs. 20.

Flowering Trees in India

Lavishly illustrated, lucidly written, the book gives a delightful account of the flowering trees in India ; price, Rs. 15.

Rice in India

A very comprehensive monograph that summarizes all the research work done in this country on rice cultivation ; price, Rs. 21.

Write to

The Business Manager
Indian Council of Agricultural Research
Queen Victoria Road, New Delhi-2

YOUR WAY OF GROWING RICE MAY NEED SOME CHANGES !

by
P. C. Raheja and
S. L. Chowdhury
Indian Agricultural Research Institute
New Delhi

IF you transplant paddy seedlings ten inches × ten inches or 15 inches × 6.67 inches or 20 inches × 5 inches, you will still be planting the same number of seedlings in an acre. But you will be surprised that these types of spacings result in different per-acre yields.

This was what was seen in an experiment conducted during the 1957 *kharif* season at the Indian Agricultural Research Institute, New Delhi.

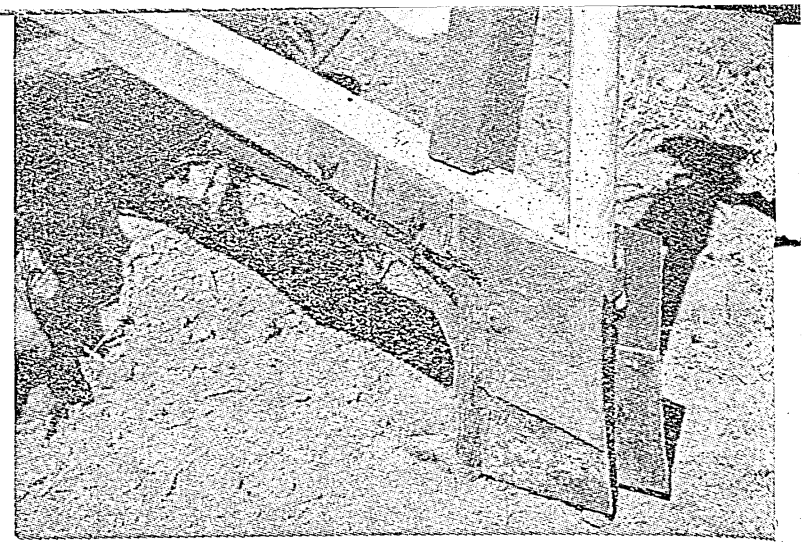
Planting with the first spacing gave a per-acre yield of 70.76 maunds, that with the second, 62.92 maunds and with the third, 60.69 maunds. This showed that a ten inches × ten inches spacing was better by 7.84 maunds than the second spacing, and that there was not much difference in yield between the second and the third.

The experiment conducted at the Institute was to test the modifications needed in the Japanese method of paddy cultivation to suit local conditions.

Not only was the spacing desirable in transplanting seedlings investigated in the experiment, but also manuring, the method of application of fertilizers and earthing.

NATURE OF SOIL

The soil on which the experiment was conducted was sandy loam of average fertility. Healthy, vigorous seedlings were raised, as under the Japanese method, from good, selected and 'Perenox'-treated seed of the variety *N.P. 130*. The field was cultivated once by a furrow-turning plough immediately after the preceding pea crop had been harvested.



The common single-row cotton-drill was improvised to 'place' the fertilizer along marked rows at specific distances

A month before transplantation, the one-acre experimental field received 20 cartloads of farmyard manure worked in with a *desi* plough. Before the experimental plots were laid out, 300 pounds of superphosphate were drilled five to six inches deep into the entire field with a *desi* plough in the same manner as wheat is sown with a *pora* tube.

The crop was weeded thrice and irrigated ten times during the entire growth period of three months. During these months, the rainfall received was 20 inches.

In addition to the farmyard manure and superphosphate applied, experimental plots received nitrogen in three levels. The levels were 30, 60 and 90 pounds per acre, and the fertilizer applied was ammonium sulphate. It was found that the yields increased with the increase in the dose of ammonium sulphate applied.

The results obtained are given in the following Table.

Level of nitrogen (per acre)	*Yield per acre (in maunds)*
30 pounds nitrogen (150 pounds of ammonium sulphate)	58.42
60 pounds nitrogen (300 pounds of ammonium sulphate)	66.72
90 pounds nitrogen (450 pounds of ammonium sulphate)	69.28

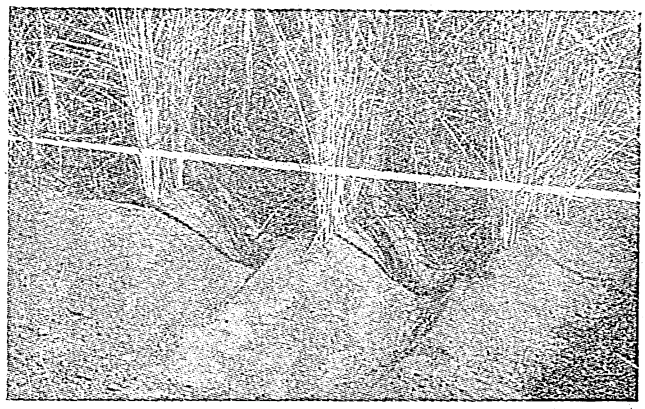
By applying 300 pounds of ammonium sulphate, the crop gave 8.30 maunds more paddy per acre than when 150 pounds of the fertilizer were applied. The yield difference between 300 and 450 pounds of ammonium sulphate application was, however, small.

APPLYING FERTILIZER

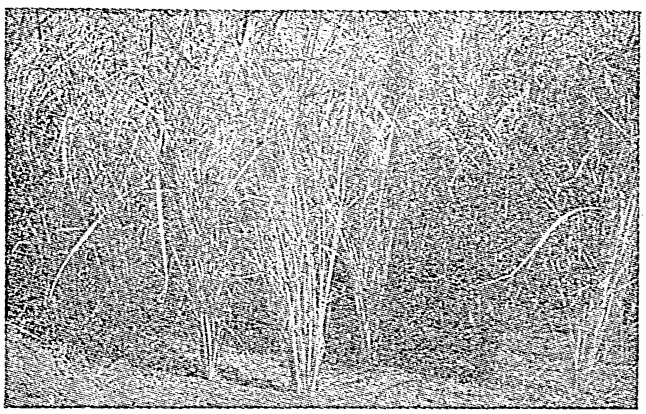
Farmers normally apply the nitrogenous fertilizer broadcast to their paddy lands. This is not an efficient method of fertilizer use. So, in the experiment, the quantities of fertilizers in some plots were

broadcast and in some others 'placed' in the row five inches deep under the seedlings. In broadcasting, the fertilizer was spread uniformly over the plot and puddled in. In the placement method, the fertilizer was drilled in rows marked ten, 15 and 20 inches with wooden frames when the excess of water in the plots had soaked in after puddling.

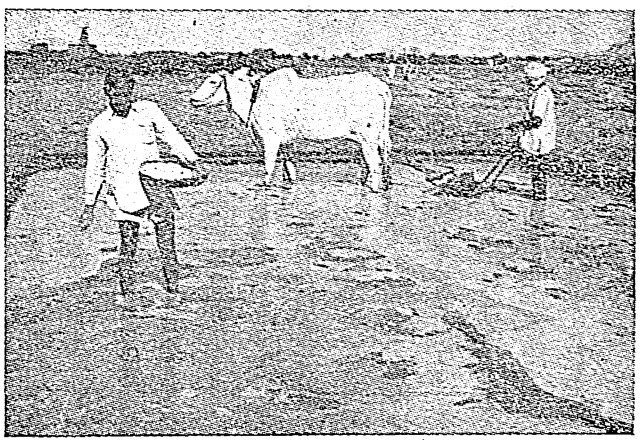
In one case, the plant rows were earthed...



...in another, the crop was allowed to mature on flat beds



In one field, the fertilizer was 'broadcast' over the plot surface and puddled in...



The two methods gave a real difference in paddy yield. The results are given below.

Method of fertilization	*Yield per acre (in maunds)*
Fertilizer applied broadcast	61.22
Fertilizer 'placed' five inches deep under the seedlings	68.38

It was thus seen that by placing the fertilizer in the seedling row, it made a difference of 7.16 maunds of paddy per acre.

EFFECT OF RIDGING

It is said that by ridging the plant-rows the crop-yield is increased and lodging of the plants is prevented. This also was investigated in the experiment. Rows of the paddy crop in certain plots were ridged with a hand-ridger 45 days after transplanting. Since the weather conditions were favourable, no lodging occurred in the plots which were not ridged. Hence, the effect of ridging on lodging could not be studied ; but the yield obtained showed a clear difference, as given below.

Treatment	*Yield per acre (in maunds)*
Plant-rows earthed	67.83
Plant-rows matured on flat beds	61.77

Merely ridging the plant-rows meant six more maunds of paddy per acre ! The experiment was repeated and gave the same results as the pilot experiment.

It must also be said that these are not chance results, but will be true in nine out of ten cases when the circumstances are similar.

The experiment has some lessons for the paddy farmer ; he can place his fertilizer in whatever dose he applies it to the crop ; he can ridge the transplanted crop with a *desi* plough and get better and still better paddy yields.

...In another, it was 'placed' through the *pora* tube attached to the improvised cotton-drill



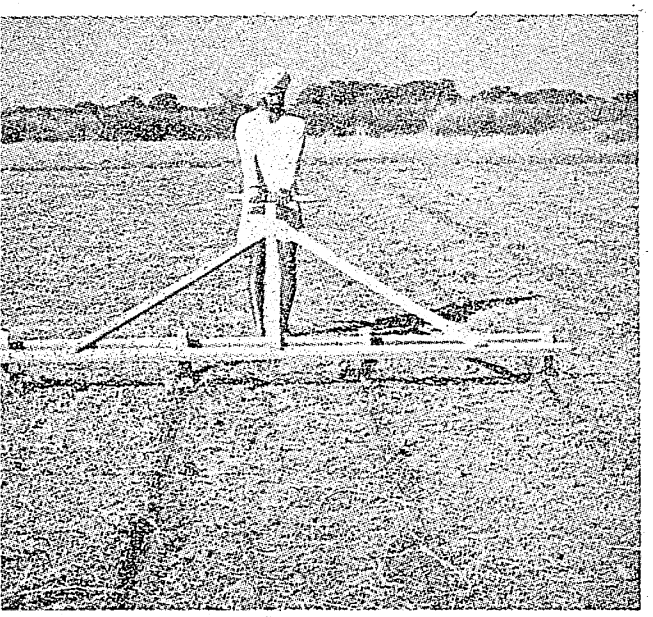


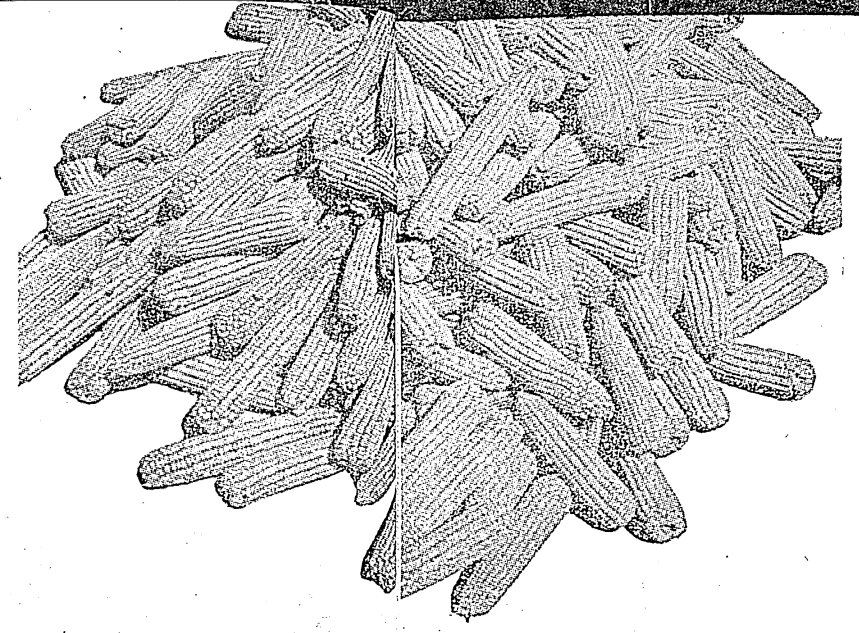
1. GIVE THE LAND A GOOD TILTH



2. FERTILIZE WELL

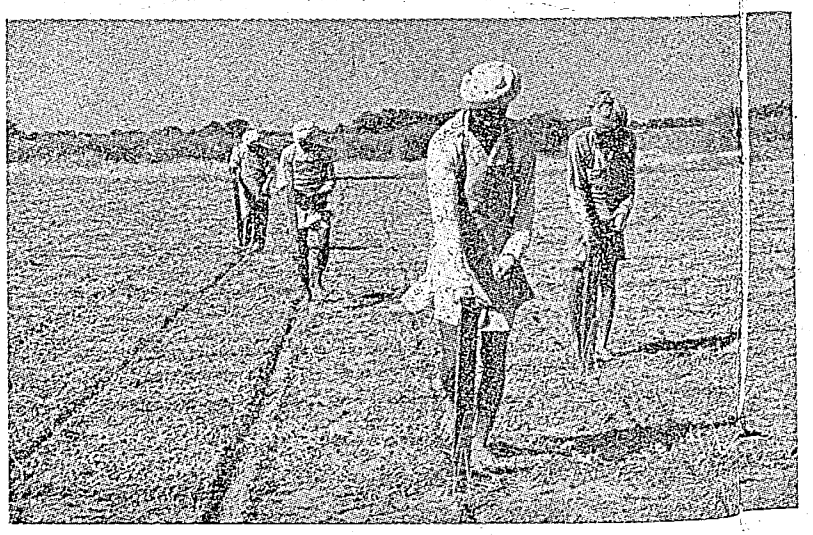
3. MARK YOUR FIELD





8 STEPS FOR A HGH YIELD WITH HYRID MAIZE

4. SOW WITH THE CORN-PLANTER



5. SOW THREE SEEDS TO A HILL





6. TOPDRESS WITH FERTILIZER



7. KEEP FIELD CLEAN OF WEEDS

8. IRRIGATE—JUST SUFFICIENT



The Fine Points

A NEW source of making good profits has recently been opened to farmers in Bilaspur district of Madhya Pradesh. It is fish culture.

About six years back, as an experiment, a tank in Bilaspur, with a water area of about 19 acres, was stocked with fingerlings of *Catla*, *Rohu* and *Mrigal*, the fast-growing varieties of fish suitable for growing on a commercial scale. The experiment was successful.

In 1953-54, six more tanks in Bilaspur and at Ratanpur, an interior village in the district, were stocked with fingerlings of the same fish.

At the end of the first year, Rs. 3,600 had been spent on stocking these tanks but the receipts from one tank alone amounted to Rs. 4,588. In 1955-56, Rs. 4,500 were spent on the five tanks and the catch brought in Rs. 9,000. Last year, as against an expenditure of Rs. 4,000 the gross returns amounted to Rs. 16,000 in spite of the fact that one more tank remained to be exploited.

No wonder that the shrewdest farmer in Bilaspur is impressed by the way fish can pay.

Remembering that fish is a very nutritious food, and the fact that it can bring in good income, all inland waters, especially in tanks, need to be fully utilized for fish culture.

Contributed by the Fishery Section

Bilaspur Division, Bilaspur (M.P.)

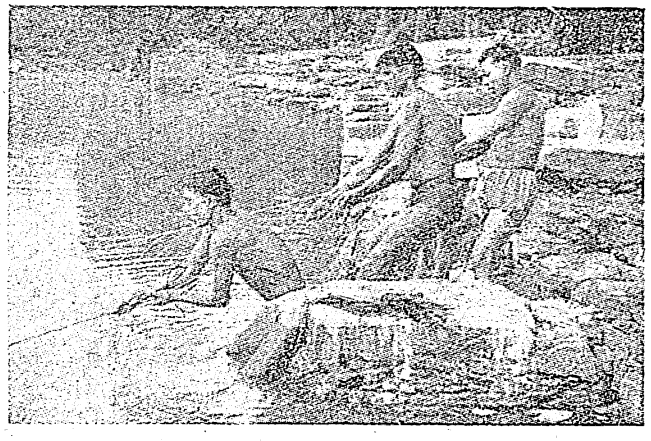


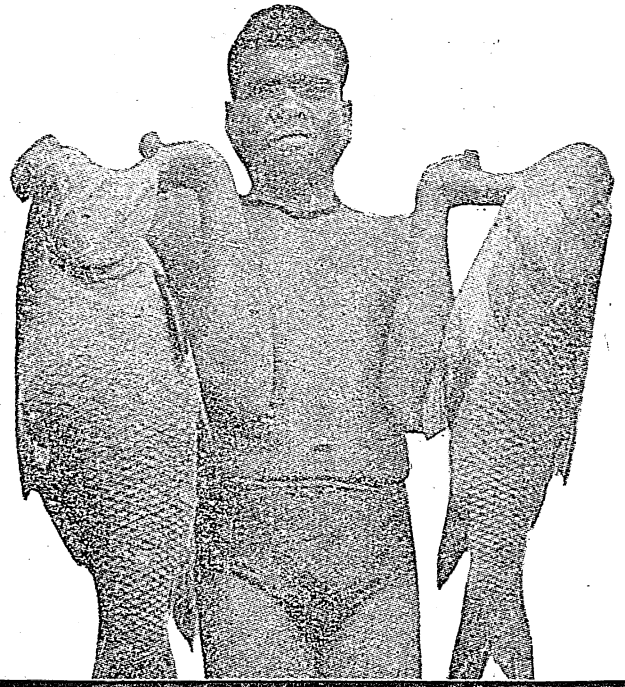
"HARVESTING" FISH FROM THE BHIMA TANK IN BILASPUR DISTRICT

The net has been cast

Specimens of *Catla* weighing 22 pounds, shown in this picture, were not lacking in the catch

Fish being hauled ashore from *one* side to prevent their escape

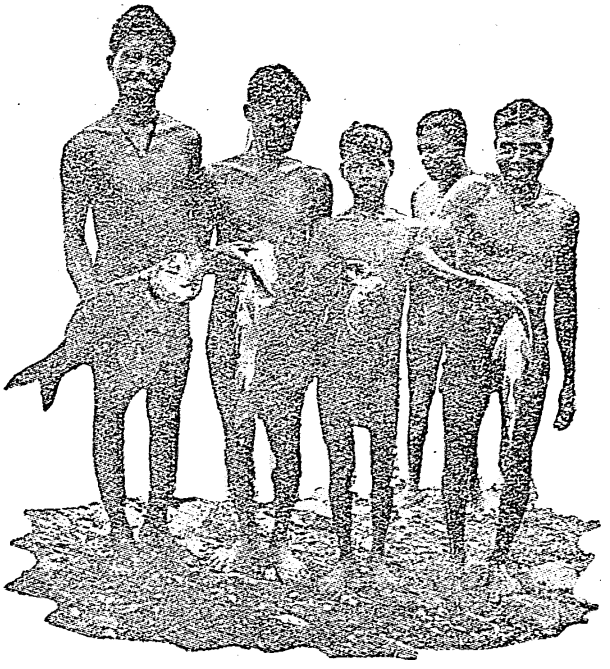




of Fish-rearing



This haul weighed 12 maunds,...



...no wonder the fishermen were proud to display the plump fish they had harvested

'PHENOVIS'

Every sheep breeder knows that even when feeding on good monsoon grass his sheep often get thin and sometimes die. This is due to lakhs of very small worms that suck blood from the gut and so make the sheep weak.

Treatment with 'Phenovis' four times a year will control these worms. The first dose should be given just before the monsoon, the second and third doses should be given during the monsoon, and the last dose should be given one month after the end of the monsoon. Your veterinary doctor will show you how to give the drug.

Ask your Veterinary Doctor

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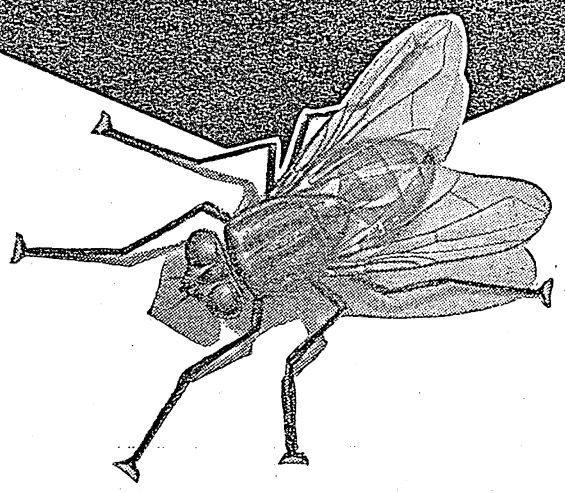
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MALATHION *insecticides give superior control with greater safety in dealing with many insects on fruit and vegetable crops, flowers and ornamentals.*

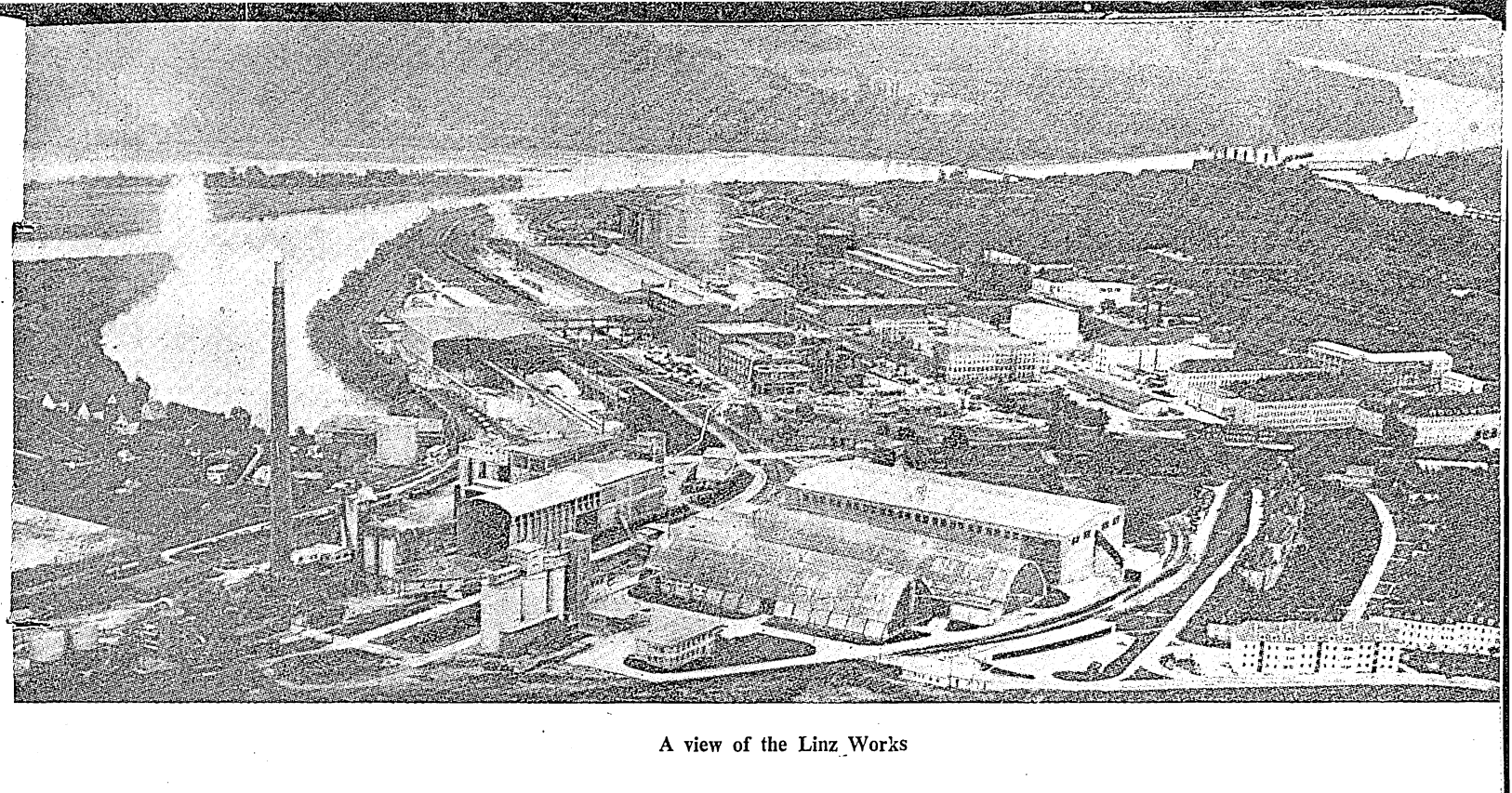
MALATHION *is available in insecticide preparations made by leading insecticide manufacturers.*

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CYANAMID OF GREAT BRITAIN LTD

FARM AND HOME DIVISION

BUSH HOUSE, LONDON, W.C.2



A view of the Linz Works

THE FERTILIZER

THAT HAS HELPED INCREASE YIELDS ON AUSTRIAN FARMLANDS

DURING the last 20 years, the yields of wheat, rye, barley, oats, grain maize, potatoes and sugar-beets in Austria have shown very large increases, the highest increase being in potatoes (about 28 per cent) and wheat (about 23 per cent). These increases are largely due to an increased application of nitrogenous fertilizers.

In Austria, of the four million hectares of agricultural area, 2·3 million hectares are grassland and 1·7 million hectares arable land.

Farmers last year used as many as 151,861 metric tons of nitrogenous fertilizers. Among these, the most widespread nitrogenous fertilizer in use was calcium ammonium nitrate (nitramoncal), accounting for almost 92 per cent of the total nitrogenous fertilizers used.

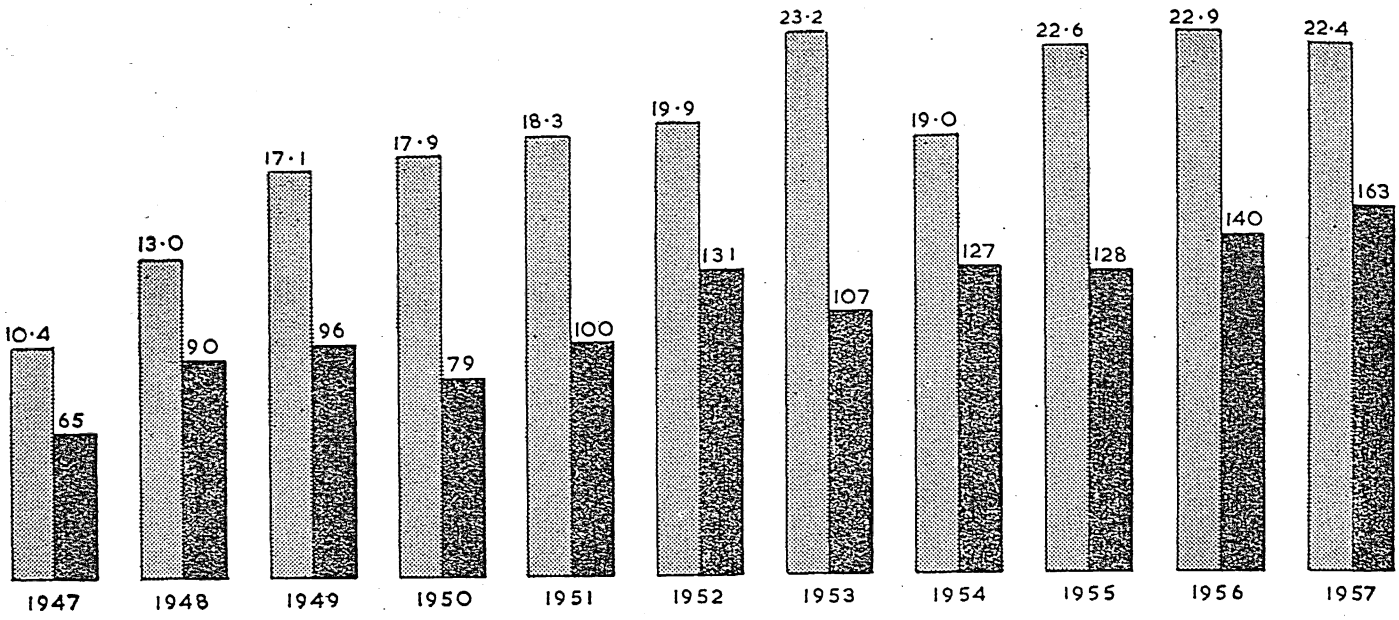
This fertilizer is produced at the mammoth factory at Linz, Austria.

Linz has steel works which produce coke oven gas, containing about 60 per cent hydrogen. Coke oven gas is purified and the methane contained in it is broken into its elements so as to increase the hydrogen. By high pressure and temperature, this hydrogen and the nitrogen in the air are made to combine to form ammonia. Part of the ammonia is transformed into nitric acid and together with the remaining ammonia forms ammonium nitrate.

To reduce the hygroscopicity and inflammability, 60 per cent of the ammonia is granulated together with 40 per cent of calcium nitrate. Then calcium ammonium nitrate is formed.

The fertilizer thus produced contains a total of 20·5 per cent nitrogen, one half in the form of nitrate and the other half in the form of ammonia.

The quantity of the fertilizer to be applied varies with the soil, climate and previous crop variety. This is found out through field experiments. Thousands of such experiments have been conducted in the country.



Increased wheat yields obtained in Austria from year to year as a result of the mounting use of nitramoncal

These experiments have shown that by applying one kilogram (a pound is equal to 0.451 kilogram) of the nitrogenous fertilizer, the following surplus yields are obtained.

Cereals	14 kilograms
Potatoes	80 kilograms
Sugar-beets	100 kilograms
Hay	25 kilograms

Of course, the best yield in quantity as much as in quality can be had only if the soil has sufficient phosphoric acid and potassium in it.

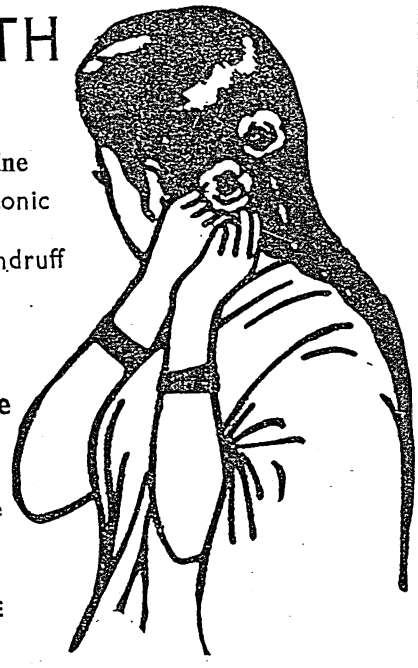
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INDIAN DAIRY YEARBOOK

The Indian Council of Agricultural Research has undertaken to publish annually an Indian Dairy Yearbook. This Yearbook will contain information about: livestock census; intensity of production of milk per sq. mile; distribution of dairy cattle in different areas; centres of export and prices of dairy cattle; milk production and consumption in India and other countries; price of milk and its trend during the recent past; import of dairy products for the last 50 years; quality standards for milk and milk products under Food Adulteration Acts and "Agmark" Schemes; statistics about organized milk and dairy schemes in various states together with requirements and present sources of supply of equipment with plans for their development, etc. It will also contain a list of officials and private persons engaged in the dairy industry and a list of manufacturers and dealers of dairy machinery in India and abroad.

The above information is being collected from the various Ministries and State Governments and private institutions. However, in order that the Yearbook may be as comprehensive as possible, all those directly or indirectly connected with the dairy industry are requested to supply to the Secretary, Indian Council of Agricultural Research, New Delhi, such information as they think will be of value for the Yearbook, by the 15th June, 1958, at the latest.

In particular, persons who are trained in dairying or are working in this field should kindly supply the following particulars for inclusion in the Yearbook: name, date of birth, qualifications with years of passing, experience including main positions held and the present post.

Manufacturers and dealers of dairy equipment should also supply information about the items manufactured or supplied by them for the industry.

Any enquiries as to the form, etc., in which the information is to be supplied may please be sent to the Secretary, Indian Council of Agricultural Research, New Delhi.

Business enquiries from advertisers, etc., are also welcome.

The Banyan — the Tree of Trees

by

M. D. Chaturvedi

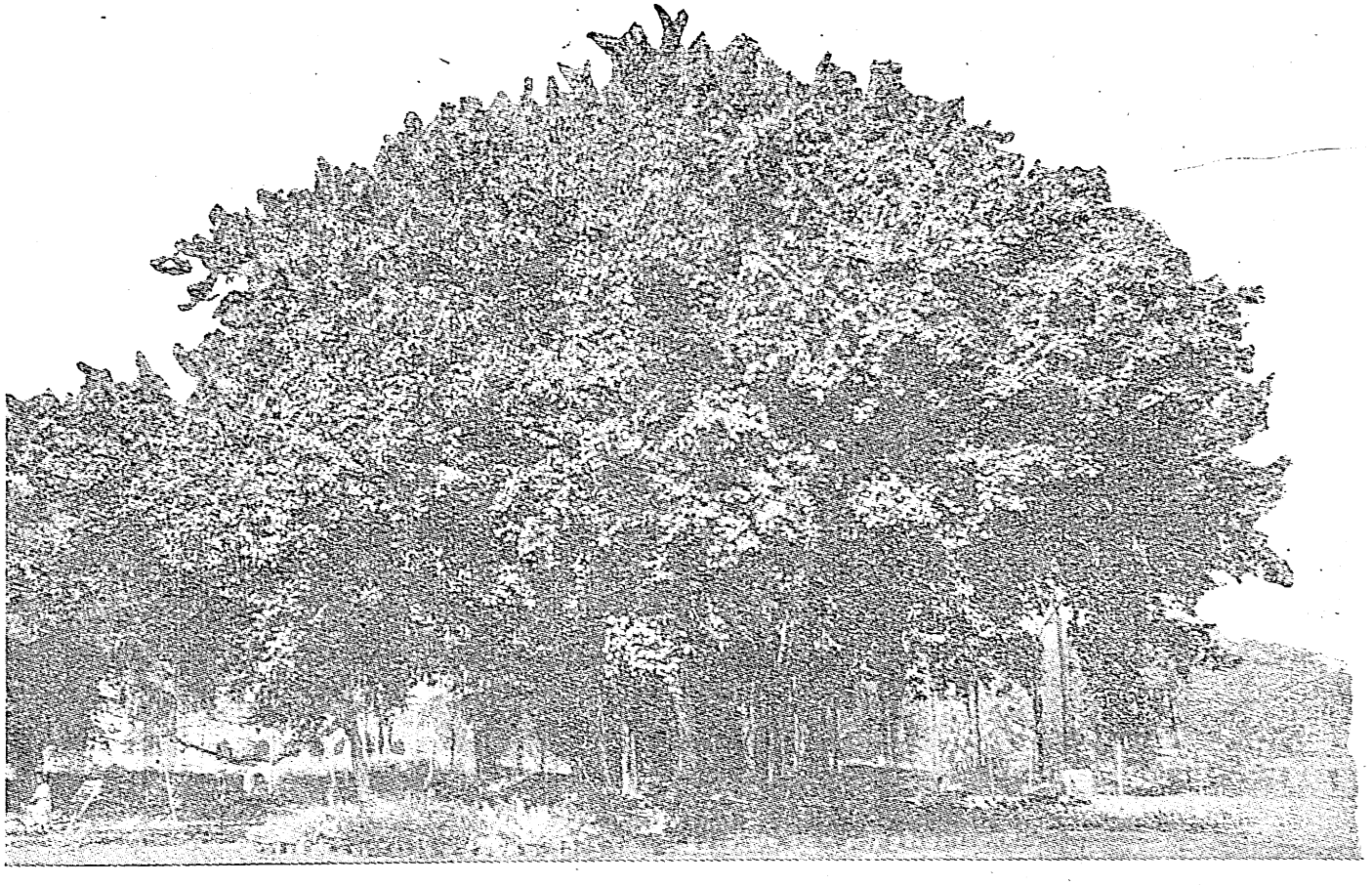
A GIANT among trees, the banyan is noted for its spread, not height. It occurs throughout the Indian subcontinent, flourishing more particularly in regions of average rainfall, around 30 inches, per annum.

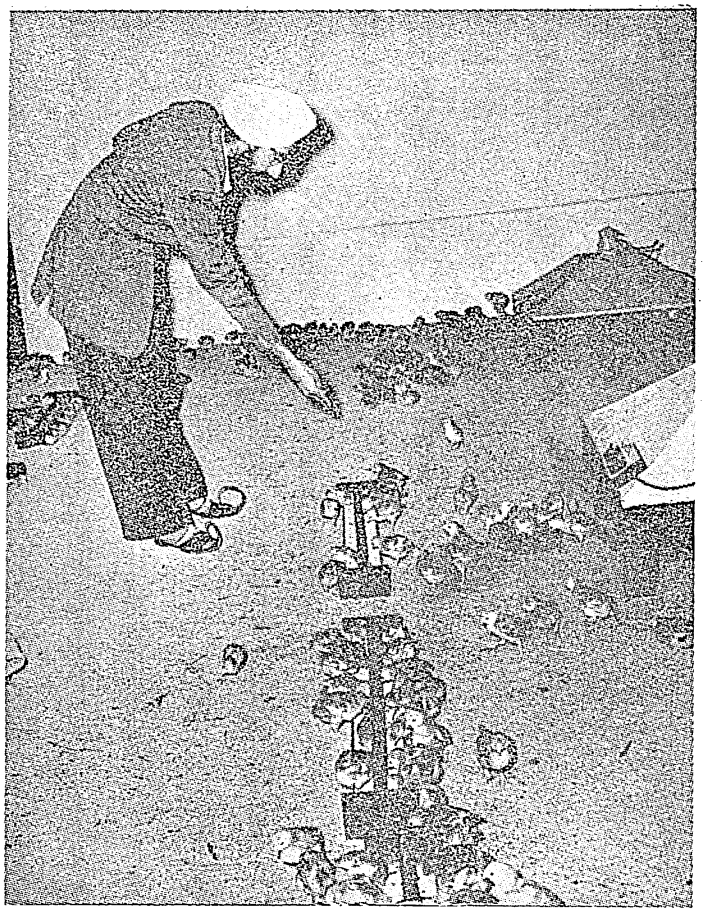
The banyan is an evergreen tree with large, horizontal branches from which descend aerial roots to constitute new stems by means of which the tree literally advances to occupy more and more ground. In course of time, the main trunk disappears, and younger stems carry on. The leaves are shiny, thick and leathery, and when plucked exude a milky juice.

The finest example of banyan is met within the Botanic Gardens at Calcutta. It is said to have originated from a date-palm in which the seed first germinated in 1782. According to Colonel Prain, it had in 1900 : girth of trunk, 51 feet, and that of the crown, 938 feet; height, 85 feet; number of fresh stumps developed from aerial roots, 404. The main trunk has died since but the fresh stems occupy quite a few acres today. Warner measured a banyan at Wysatgarh near Satara which had in 1882 a spread of 1,587 feet ; another near Poona, 2,000 feet (Troup's *Sylviculture,* vol. 3).

The tiny banyan seed has really no chance of survival on the ground. It usually starts its life by germinating in forks of trees where it gets lodged by birds. Out of reach from damage by animals, the young

(Contd. on page 30)





After seven days, the chicks had taken well to their new homes

THE 30,000 BABY CHICKS THAT CAME TO INDIA

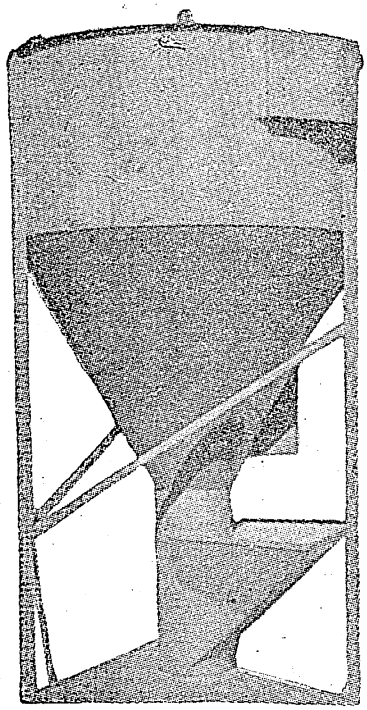
by
N. S. Garewal
Poultry Development Officer,
Govt. Model Poultry Farm
Delhi Cantt.

WHEN it was finally decided to accept the Technical Co-operation Mission offer to fly 30,000 day-old chicks of high productivity to India in February, 1956, a great amount of spade-work had to be done for housing and rearing such a large number of chicks at a single time. The Poultry Farm in Delhi State was selected as the most suitable place for the purpose, and there was still much to do before the chicks could be taken charge of. The housing space was not sufficient, additional electric supply and many other necessary equipment were to be arranged.

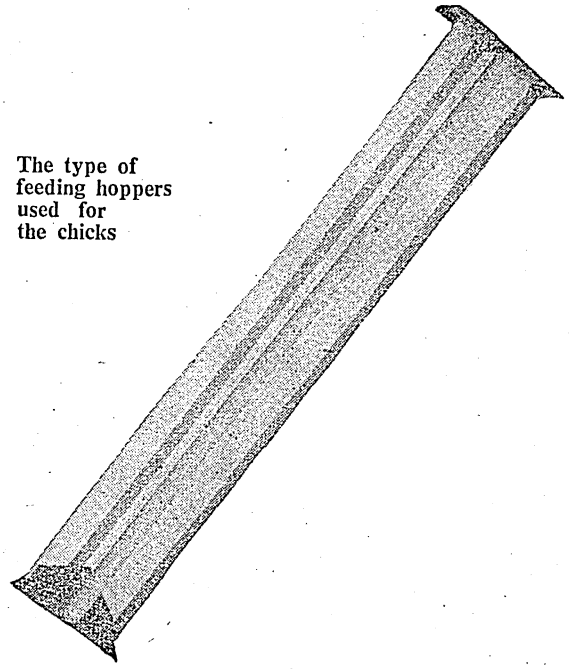
Fortunately, with full co-operation coming forth from the Delhi State Administration, the C.P.W.D. engineers and the military authorities, all the arrangements were completed in a record time and the Farm declared ready to receive the winged guests quite ahead of their scheduled arrival.

The chicks were intended to serve as the foundation breeding stock so as to step up poultry production in India.

On 17th February, 1956, a chartered plane landed in Delhi with 300 air-boxes containing the 30,000 baby chicks. These boxes were arranged in wooden crates



A mechanical feed-mixer—the equipment was handy for preparing chick feed



The type of feeding hoppers used for the chicks



A 400-capacity incubator supplied by the T.C.M.

in the plane so as to admit a free circulation of air, as chicks were living on air and the stored-up food in their own bodies.

Ceremonies over, the caretaking officer in charge warned the stewards that they hurry up and water and feed the chicks, as these were already under shipment for over 58 hours.

QUICK TRANSPORTATION

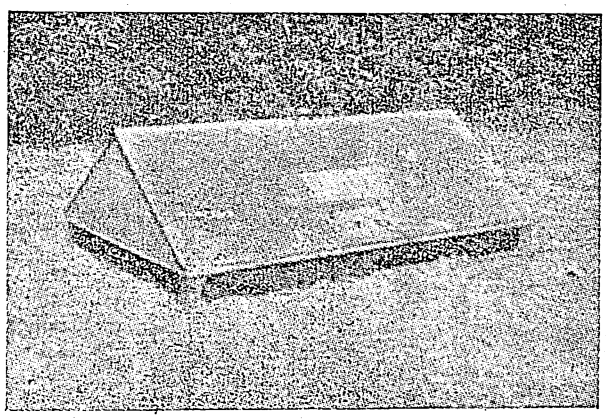
Trucks of the Development Department of Delhi State took over their part of the job. They transported the entire lot from the airport to the State Poultry Farm in a record-breaking 40 minutes.

All those, men and women, who had come to witness the baby chicks being handed over, got into the spirit of this adventure and lent an active hand to the crew in putting the chicks under the 150 foster-mothers kept ready to foster the babies. In the next half an hour after arrival at the Farm, the 30,000 chicks had been watered and fed.

Before the day was out, a complete record of the different strains of the two breeds, White Leghorn and Rhode Island Red, and the mortality in transit had been compiled. It was found that the mortality in transit worked out to only 1.3 per cent.

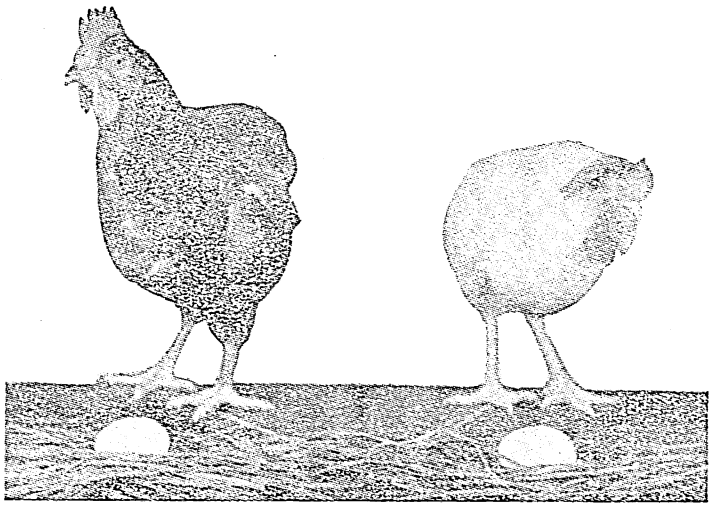
The following day and thereafter, the chicks were given a balanced all-mash feed made up of cereals, groundnut cake, wheat bran, fishmeal and minerals. In addition, they got skim-milk and green leaves.

Such chick brooders were an important item of the new equipment received

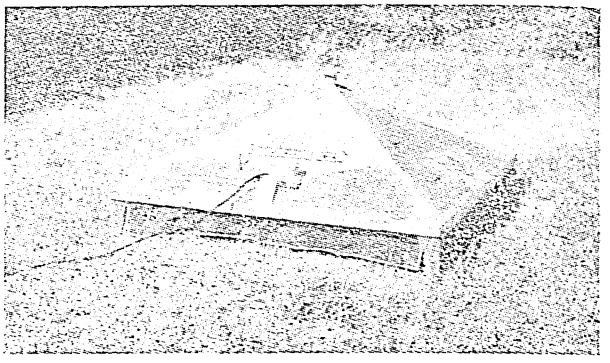




One of the many watering pots used for the baby chicks



First to lay an egg was a White Leghorn bird (*right*), followed by a Rhode Island Red (*left*)



Another type of brooder used for the chicks

PRECIOUS CARGO

To take care of the precious cargo and supervize the rearing, poultry experts like Dr. Halbrook, Dr. Naidu, Dr. Tulsa Ram along with the Development Commissioner of Delhi, Dr. J. C. Ramchandani, were available at all times.

Over 7,700 two-week old chicks were despatched to the neighbouring State Farms in Uttar Pradesh, the Punjab, Rajasthan and the Indian Veterinary Research Institute at Izatnagar, by truck, rail and air.

Consignments were also sent to the various other states. In all, 18,111 chicks were sent to 19 destinations in the country from Jammu and Kashmir to Kerala, in 122 air-boxes and 390 wooden crates. The Delhi State Farm retained 4,622 little chicks.

After six weeks, they received vaccination against the Ranikhet disease and fowl-pox, the most common infectious diseases of poultry. The poultry chicks withstood the reaction as satisfactorily as our Indian strains do.

This was in 1956. The baby chicks today are no longer chicks, but full-grown hens and cocks, multiplying manifold in the different places where they are being reared.

The first egg laid by the foreign consignment was by a White Leghorn pullet of 'Bulkley' strain exactly when she was five months old. Nor did the Rhode Island Red lag far behind. A pullet of the 'Crooks' strain of the Rhode Island Red laid her first egg at the age of five months and eight days.

THE BANYAN

(Contd. from page 27)

seedling starts its aerial existence, throwing down its roots along the stem of its host to the ground. Once it gets a firm grip it kills the very tree that nurses it. Likewise, the banyan germinates in the crevices of old buildings, doing a lot of damage to them.

Occurring as it does throughout the country, the banyan is known as : *bar, bargad,* Hindi ; *wad,* Marathi; *al, alada,* Kanarese ; *ala,* Tamil. It is known to botanists as *Ficus bengalensis.*

The red, ripe, round fruits which appear in pairs in April and May in the leaf-angles are avidly sought by birds and monkeys. Seedlings are best raised in boxes in fine mould mixed with powdered charcoal. Young seedlings should be protected from intense exposure to the sun. The seedlings transplant well. Cuttings up to eight to ten feet high put out at the break of the monsoon strike successfully. Small cuttings should be avoided.

Except for affording shade and shelter, the banyan has no other use. Its wood is no good even as firewood. Its leaves constitute excellent elephant and buffalo fodder. In forests, where elephants are employed in transport and extraction of timber, the banyan is specially raised and protected for their feed. It is one of the best trees to plant in camping grounds.

Three Good Reasons Why

Canadian Farming is Successful

by
Satwant Singh

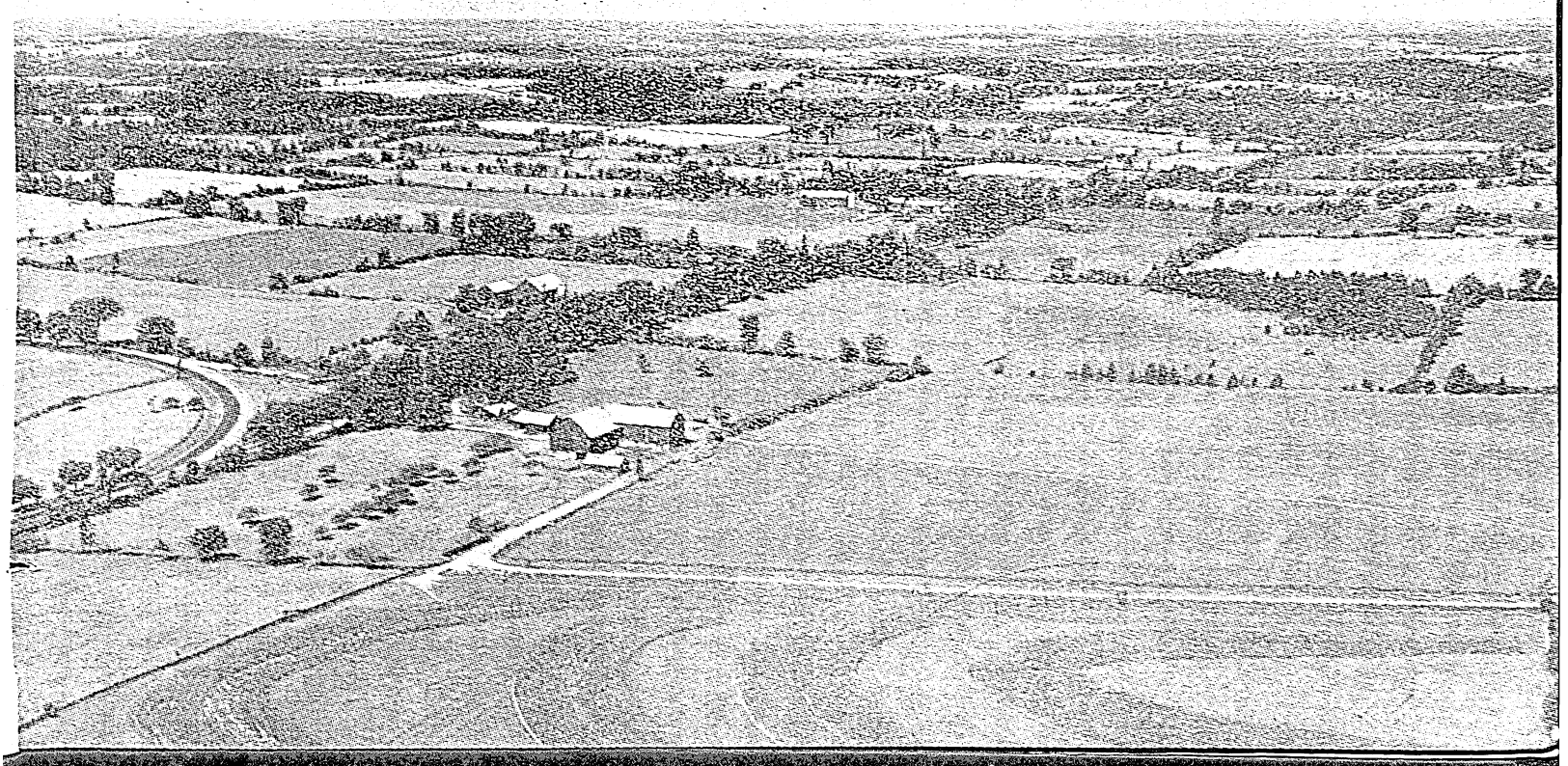
THREE aspects of farming struck me as largely responsible for the progress that farming has made in Canada.

The first is the way farmers put their technical skill to the best use and make farming commercially successful.

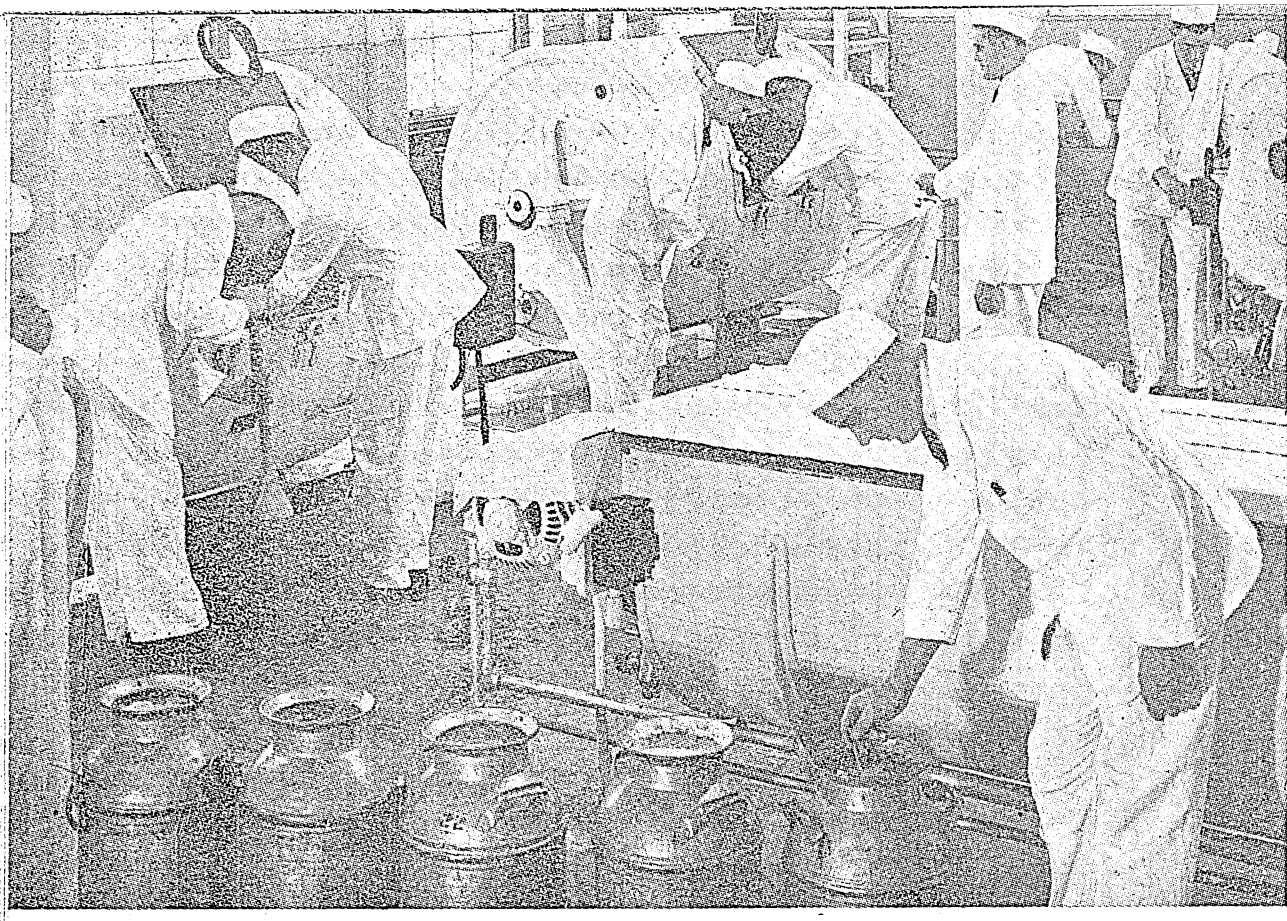
I visited the dairy farm that one Mr. Ryan owns near Ottawa. Originally a sandy land, it had been converted into one of the best dairy concerns through Mrs. Ryan's personal interest and hard work. The dairy farm was spread over 221 acres and had a livestock population of 70 Holstein cows, 33 calves and 123 sheep, in addition to 12 horses.

There were six farmhands, and the interesting thing about these farmhands was that all of them were either university graduates or diploma holders from the school of agriculture. These farmhands, after six or seven years of work on this farm, would purchase farms in the prairie areas and start as independent farmers.

They earn the necessary capital as they work on the Ryan farm. In addition to their wages which range between $100 and 150 a month, each of them would earn a bonus of 2½ per cent of the milk receipts and 2½ per cent of the sale proceeds of all breeding stock sold. The employer looks to their board, lodging, laundry and half of the medical insurance. In addition,



Terracing and other soil conservation practices are considered very important by Canadian farmers



A well equipped butter-making factory in Canada

the employer gives a guaranteed liability of $25,000 as insurance against accident on the farm while using farm equipment. The farmhand who shows livestock at the cattle fair gets 15 per cent of the prize money ; the one who feeds, trims and makes the cattle ready for the show also gets the same percentage.

All farmhands get two weeks' holidays with pay every year, in addition to the weekly holiday. Adding up all these benefits, each farmhand earns about $3,000 a year, apart from good, practical experience. Naturally, they put by half this amount, so that ultimately when they quit they can purchase land and be independent farmers.

The Ryan farm itself was purchased many years ago for $25,000. Its present stock value is about $121,000, in spite of the liberal wages paid to the staff.

GOVERNMENT CONTROL

The second interesting thing I noted in Canada is the governmental control on the distribution of seeds, feeding stuffs, fertilizers, pesticides (including fungicides) and the grading of farm products like fruits, vegetables and honey.

Through legislation, the government controls the manufacture, sale and import of all these items necessary for farmers. The trade has to register, and also ensure that the minimum specifications regarding each of these goods are satisfied. Inspectors, with the co-operation of farmers and their organizations, sample these stuffs from time to time, and any sample which is not in accordance with the specifications on the label is detained at the expense of the owner or the seller till the material is changed to satisfy the specifications given.

In the case of seed, only approved varieties are allowed to be sold. No mixture is allowed to be sold as seed. In the case of feeding stuffs, a certain percentage of proteins has to be guaranteed in them. The number of brands available for farmers is also controlled so as to avoid confusion.

RURAL FINANCE

The third aspect of Canadian farming is the important role rural finance plays in it. In Toronto, I learnt that 150 local organizations for rural finance on a co-operative pattern were working there. They distribute feeds, fertilizers and general supplies to farmers and help them in the marketing of livestock and dairy and poultry products.

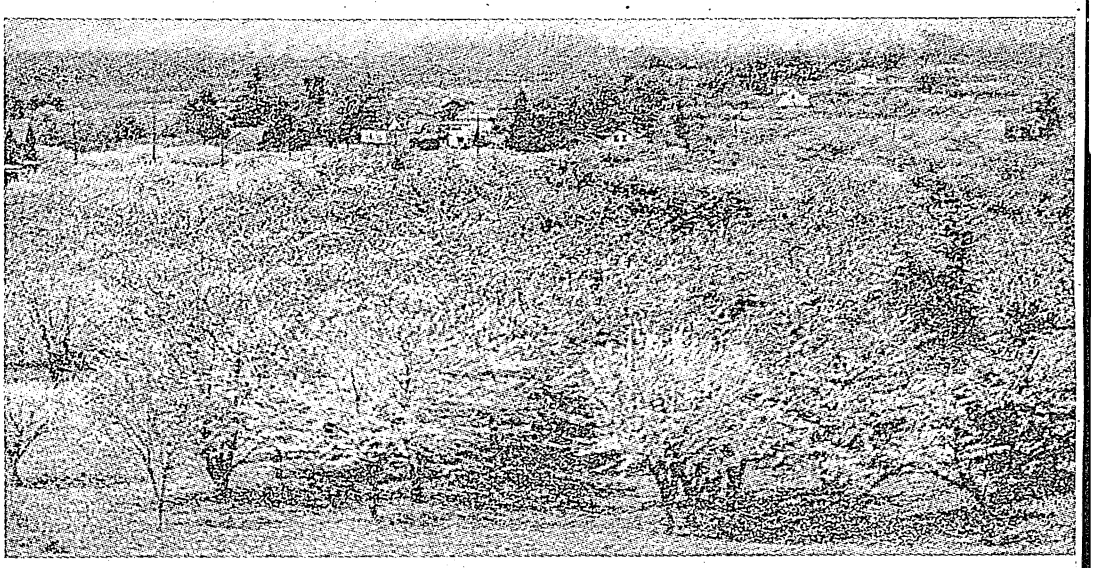
Three experts provide training in rural leadership which is the main drive for making the rural co-operatives a success. Farmers have an interest in the business of their co-operative as they are its shareholders.

The co-operatives, though sponsored by the government, function independently, and it is the education of the farmers that ensures that the co-operatives are

managed efficiently and not thrown back at the government in times of difficulty. The Adult Education Associations strive to awaken the farmers to the need for solving rural problems by voluntary action.

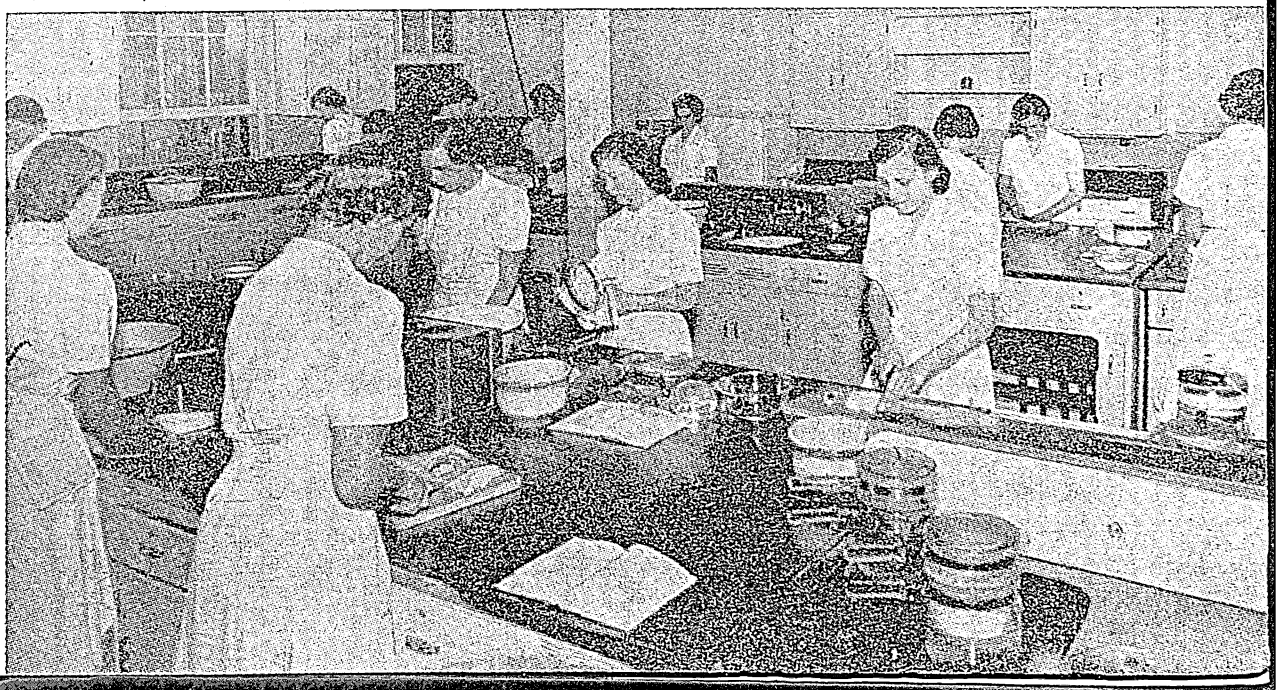
Before forming a co-operative association, farmers agree that till such time as the association is able to stand on its own legs, they will not demand any dividend on their shares. Annual profits on their share money, if any, are credited to their accounts, and to a certain extent serve as a compulsory saving and an insurance, at the same time providing the capital needed for development purposes and raising of loans.

The government provides loans to farmers for carrying out farm improvements or for purchasing farm equipment to enable them to start their farm business. Loans are also available to individual farmers for grading, cleaning, packing, storing, drying, processing or marketing of farm produce.



Peach and cherry trees in bloom in a small orchard on the Niagara peninsula

Farm girls attending a cookery class



NEW KNOWLEDGE FOR CARDAMOM GROWERS

by

P. Abraham

RECENT investigations in the Singampatti Hills have given some very useful information on how best cardamom seedlings are raised.

The investigations were conducted under a scheme for providing scientific aid to the cardamom industry and sponsored by the Indian Council of Agricultural Research.

Raising seedlings in nurseries is the most difficult part of cardamom cultivation. Cardamom planters find getting satisfactory germination of cardamom seeds very difficult due perhaps to the defective methods they adopt.

Not more than 11 to 15 per cent of the seeds sown in the nursery-beds germinate. Consequently, the seed-rate used in raising seedlings and the cost of seed are usually very high. Nursery diseases in addition cause extensive failures of seedlings. Cardamom nursery practices, therefore, need to be well improved so as to obtain maximum seedlings.

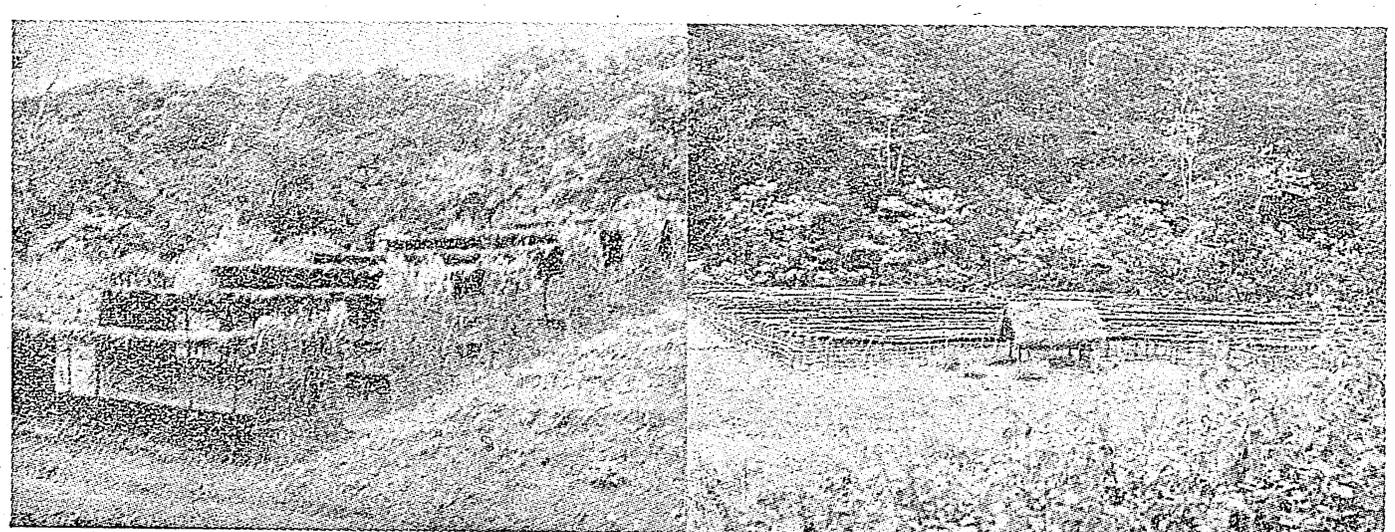
Cardamoms can be propagated vegetatively through rhizome cuttings. But the mosaic disease of cardamom is carried through these cuttings. Unless, therefore, rhizome cuttings are obtained from a region entirely free of the disease, new plantings with rhizomes should be avoided till the disease is completely under control.

Fortunately, the mosaic disease is, as far as is known, not transmitted through seed. Propagation through seed is, therefore, the safest method of raising new plantations.

In the primitive stages of growing cardamom on a plantation scale, cardamom seedlings which

Cardamom first nurseries protected by...

...slanting, thatched roofs ...*pandals*







Cardamom seedlings aged...

...two years

...8 months, 6 months and, the remaining three, 4 months

came up spontaneously on thinning the shade of forest trees, could be collected and redistributed to form a plantation of a more even stand. This method is still employed in a number of places. Self-sown seedlings occurring in older cardamom plantations are also used in this manner.

In the *male* system of cardamom cultivation practised in Coorg, a plot of jungle is cleared in the same way as for ordinary cardamom planting on this system and seed is sown broadcast about February or March. The seeds germinate in the hot weather months and the seedlings are left to develop until the following year when they are transplanted to their permanent positions.

As these old methods were very unsatisfactory, a system of germinating seeds in prepared beds was developed by growers in most cardamom-growing regions. Clearly, this is the only sound way of obtaining a satisfactory outturn of seedlings from given quantities of seed. Even this method was vastly improved upon under the I.C.A.R. Scheme.

SEED VIABILITY

The fact that cardamom seedlings come up spontaneously when trees are filled and the overhead canopy thinned in jungles where cardamom is indigenous, indicates that seeds can remain dormant in the soil for long periods of time. This happens under the very special light, temperature and other conditions obtainable in the soils of the thick jungles of the higher elevations in the hills.

Experiments were laid out to find out how long freshly-collected cardamom seeds retained their viability under storage in the laboratory. Seeds were sown in nursery-beds immediately after harvest and at fortnightly intervals up to 6½ months. The highest percentage of germination (about 75 per cent of the seeds sown) was obtained from seeds sown immediately after harvest. There was a very steep fall of 54 per cent in the viability of seed during the first 15 days after harvest, while in 3½ months, it fell by 94 per cent. Cardamom seeds have, therefore, to be sown in nursery-beds immediately after harvest to obtain maximum germination.

SEED-BEDS

The most developed system of cardamom nursery management among cardamom growers at present is germinating seeds in a prepared bed from which they are transplanted into a second nursery-bed and finally into the field.

Results from such germinating beds and nurseries are very variable and the outturn of seedlings generally very unsatisfactory.

Although the methods of preparing the seed-beds vary in detail from place to place, the usual general lines for seed-bed preparation are followed everywhere. The beds are laid raised above the general ground level. The size of a bed varies, but it is usually not more than four feet wide and 30 to 40 feet long. The topsoil layer of the bed may be well-pulverized with ordinary soil, from which all stones and pebbles have been removed, or jungle soil or mixtures of jungle soil and sand, compost, well-rotted cattle manure or mulch debris.

In Mysore, including Coorg, seed-beds and nursery-beds are almost invariably laid in wetlands or in the valleys between hills. The beds are separated by deep channels into which water may be run, or the nurseries may be entirely rain-fed. In the Cardamom Hills of Travancore and Anamallais, the seed-beds are usually laid on the lower reaches of hill-slopes near a water source to facilitate pot-watering, but wetlands are also used as cardamom nurseries.

Widespread observations revealed that although the beds should be kept reasonably moist and well-drained, undue wetness of the beds leads to nursery diseases and poor development of seedlings. Seed-beds laid out on the lower reaches of hill-slopes on terraces near a water source and pot-watered were almost always observed to yield a higher outturn of seedlings than those laid in wetlands and other low-lying areas.

The beds may be about three feet broad and six to ten feet in length and separated by footpaths to facilitate movements between the beds for watering, inspection and other operations.

SOIL TEXTURE OF SEED-BEDS

Experiments were conducted to find out the most suitable soil texture of the seed-beds to ensure maximum germination of seeds. Mixtures of rich surface-soil taken from the jungle with either sand, leaf-mould, wood ash or well-rotted cattle manure spread on raised beds to an inch in depth, were compared with jungle soil alone spread on the beds in a similar manner.

The results revealed that the germinations in beds which received wood ash and cattle manure were significantly higher than those in jungle soil alone. The seedlings which received these two treatments were taller and healthier than those in the other treatments. A mixture of equal quantities of well-rotted cattle manure and wood ash would, therefore, be best for this purpose.

Some unwanted seeds of weeds and other plants may be present in the original and imported soils of the bed. To get rid of these, water the beds frequently for a period of about a fortnight. All such unwanted seeds would germinate, and can then be removed.

SHADING OF SEED-BEDS

In Mysore, including Coorg, cardamom seed-beds are not shaded at all until the seedlings have appeared.

When seedlings appear above ground they are shaded by raising *pandals* four to five feet above the beds. The *pandals* are thatched with branches of jungle trees whose leaves do not fall on drying. These *pandals* are very similar to those used in coffee and tea nurseries, though heavier.

Occasionally, the seedlings are shaded by a low *pandal* of not more than three feet above the bed, which is covered with a thin grass thatch to give an almost complete cover. In dry weather, this grass thatch is kept moist by frequent waterings to maintain humidity.

It was also observed that in certain places shading of seedlings was done by suspending dry leafy branches from a framework some five or six feet above the bed, instead of spreading them on the top of the framework.

In all these kinds of shading as well as non-shading before germination, there is considerable disturbance of the beds by drip from the leafy *pandals* and from the direct falling of raindrops. Even though mulched, the seeds and the seedlings are very much affected by its drip, resulting in a poor outturn of seedlings.

Widespread observations and experimentation have clearly shown that first nursery-beds even from the time of sowing should be provided each with a rain-proof thatched slanting roof. These slanting roofs are best faced eastwards to allow the morning sun to fall on the beds. The direct morning sunshine falling on seed-beds would give the warmth essential for the germination of the seeds.

Thatching of the roofs may be done with grass or other material obtainable from the jungle.

SOWING TIME

In Mysore, including Coorg and North Kanara, cardamom seeds are sown usually in September when good seeds are available and they germinate in about a month. Germinations of cardamom seeds in these regions were seen to be generally satisfactory.

In the southern areas of Nelliampathies, Anamallais, the Cardamom Hills of Travancore, Rajapalayam and Singampatti, there is rarely any likelihood of getting good seed early enough for sowing in September. In these southern regions, sowing of seed is usually done in November and germination is irregular and takes a considerably longer time, of even up to two months.

The differential behaviour of the seeds sown at these two different times may be attributed to the temperature prevailing at the different times. During November and December, a sudden drop in both air and soil temperatures occurs in the cardamom-growing regions, and this may account for some of the difficulties experienced with cardamom seeds sown late in the year in the southern areas.

Experiments were conducted to find out the best time for sowing seeds to obtain the maximum outturn of seedlings at the Research Station, Singampatti, in the extreme south of the cardamom-growing area in India. Seeds were sown in every month of the year. Fixing the results of February sowing as control (100) for comparison, December, January, March, April, May, June, July, August, September, October and November gave the results of 106, 115, 120, 92, 92, 71, 92, 24, 58, 83 and 80, respectively.

At Singampatti, the temperature gradually rises from January onwards until May, and falls with the onset of the South-west Monsoon in June. Thus, the direct relationship between temperature and germination is evident. December to March is seen to be the best time for sowing cardamom seeds in the nursery. From September onwards till December, the North-east Monsoon continues to be very heavy at Singampatti, attended by a cloudy and misty weather. These conditions do not seem to be conducive to good germinations of cardamom seed.

In the northern regions of Mysore where the smaller cardamom with prostrate panicles is grown, good seed will be available only in September-October and nurseries can be laid out only at this time. In these regions, the North-east Monsoon lasts only for ten to 15 days in October-November, and this does not seem to be a serious obstacle to the progress of cardamom nurseries laid out in September.

MULCHING OF SEED-BEDS

Just as the texture of seed-bed soil, mulching of the seed-bed is a very important factor affecting germination of seed.

It is a general practice in cardamom-growing areas to mulch the seed-beds whith dry leaves, dry grass or straw. In North Kanara, parts of old Mysore and occasionally in the Cardamom Hills of Travancore, the mulching material is the fine leaves of *nelli* or *amla (Phyllanthus emblica,* L*)* which is reported to be of special virtue for this purpose.

In an experiment on mulching, the comparative value of dry leaves cut up into small bits, jungle debris (well decayed in powdery form) and dry grass, evenly spread to a depth of ¼ inch on the seed-beds after seed is sown, were compared with no mulch. It was seen that the grass mulch was the best and jungle debris next best in securing good germinations. In areas where *nelli* leaf is easily secured, it may be equally effective.

The mulch serves as a blanket, maintaining moisture and temperature at a desirable level. This mulch may, however, be removed after the majority of the seeds have germinated.

PRE-TREATMENT OF SEED

Seed for sowing is generally collected from fully ripe fruits and is then either washed in water and sown immediately or mixed with wood ash and dried for two to nine days in the shade and then sown. If washed, rinse repeatedly until the sweetness of the aril is completely removed.

In experiments to find out suitable pre-treatments of the seed to induce quicker and better germinations, seeds were socked (1) in cowdung slurry, (2) tepid water and (3) Hortomone 'A' (0·3 per cent), each for 12 hours and then sown. There was no significant difference in germination among the above treatments. The vigour of the seedlings was also not affected by the treatments.

In another trial, seeds were treated with the fungicides, copper sulphate, 'Ceresan', 'Agrosan', sulphur and mercuric oxide. None of these fungicides could improve germinations.

One of the factors which enable cardamom seed to lie dormant for considerable periods in the jungle soil may be its hard, stony seed-coat. Any method of thinning this seed-coat was supposed to assist seed germination.

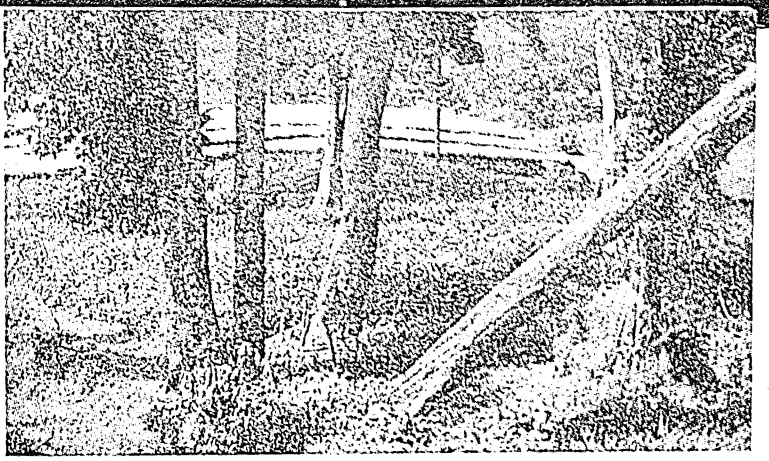
Seeds were, therefore, mixed with coarse sand in a bottle and shaken vigorously for some time. This treatment gave very good results vastly improving germination. This was due to scarification (making scratches) of the seed-coat, making it more permeable to water.

SOWING

Scatter the seeds evenly on the surface of the bed. For a three feet × three feet bed, 720 seeds would do ; this means 80 seeds go to a square foot. Just cover the seeds with a ⅛ inch thick layer of fine sand just to cover the seeds.

WATERING

Immediately after sowing, mulch the beds and start watering the beds with rose cans. Frequent (at least twice daily) and copious watering will be necessary in the early stages. The beds should be maintained moist but not too wet. The use of warm water for this purpose in the early stages adds to the warmth provided by the morning sun. Germinations start usually a month after sowing and go on for about three months.



Cardamom second nurseries under *pandals* (*background*), under the shade of jungle trees (*foreground*)

CONTROL OF NURSERY DISEASES

Considerable losses of seedlings are experienced in the nursery from 'damping off' and other nursery diseases. For controlling these diseases, spraying the seedlings with Bordeaux mixture and colloidal copper of different concentrations were tried at weekly and fortnightly intervals. Losses of seedlings from diseases were very much reduced by these fungicides, fortnightly sprayings being found to be more efficient. One per-cent Bordeaux mixture is easily made and can be generally used for this purpose.

SECOND NURSERY

When the seedlings are about a year old or have a couple of leaves, they have to be transplanted into a second nursery for further care until they are ready for transplanting into the field.

A second nursery is needed to avoid overcrowding of seedlings in the first nursery and the resultant poor growth and damage to seedlings by nursery leaf-rot and other diseases.

In Mysore including Coorg, and North Kanara and the Cardamom Hills of Travancore, beds are prepared for the second nursery also in the same way as for the seed-beds (first nursery), but there is very often the addition of more pulverized cattle manure or compost to the beds. Seedlings are planted in these second nursery-beds about six inches apart. They may be spaced wider at nine inches or even a foot or two apart, depending on the vigour and rapidity of growth of seedlings in the locality and the period for which seedlings are left in the nursery.

In the second nursery, the seedlings are lightly shaded with *pandals*, three to four feet above ground level and spread over with leafy twigs. Watering is done if necessary in the dry season. After a period of at least one year in this nursery, the seedlings are planted out in the field.

Instead of laying out the second nursery in regular beds, the seedlings when ready for transplanting may be taken out of the germinating bed and transferred to an area which is well shaded by trees and in particular

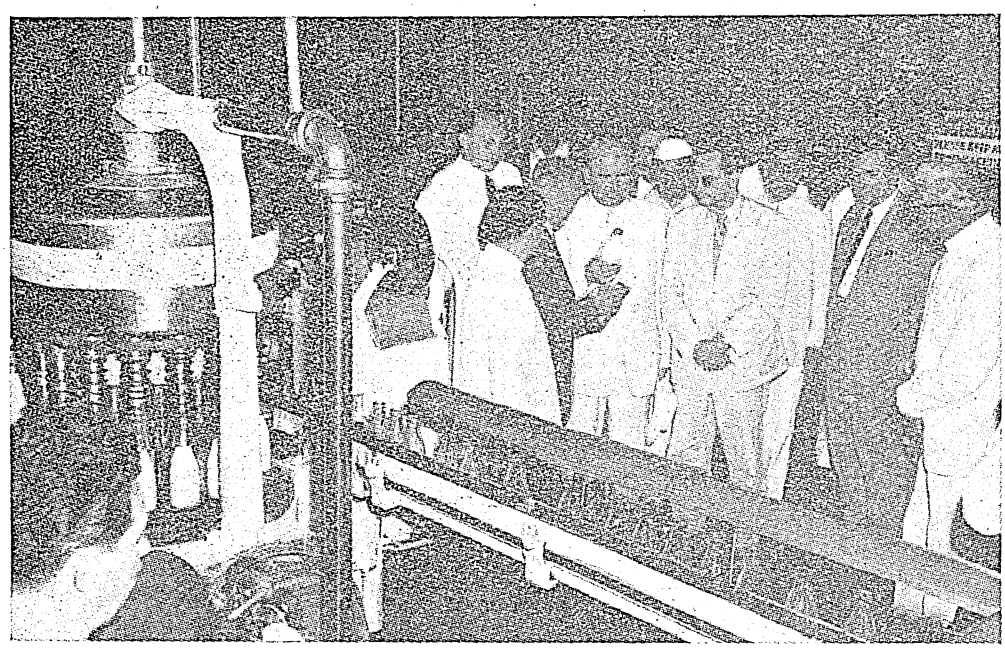
sheltered from the afternoon sun, and planted in pits two feet apart, two seedlings in a pit. If planted in June at the beginning of rains, no watering but only weeding will be needed. This kind of nursery may also be located in newly-planted areas between the cardamom clumps, and would be vastly cheaper than those laid in nursery-beds. If a mixture of cattle manure and ash is applied to the planting pits, the seedlings will grow very rapidly and vigorously.

GERMINATION TRIALS IN ASSAM

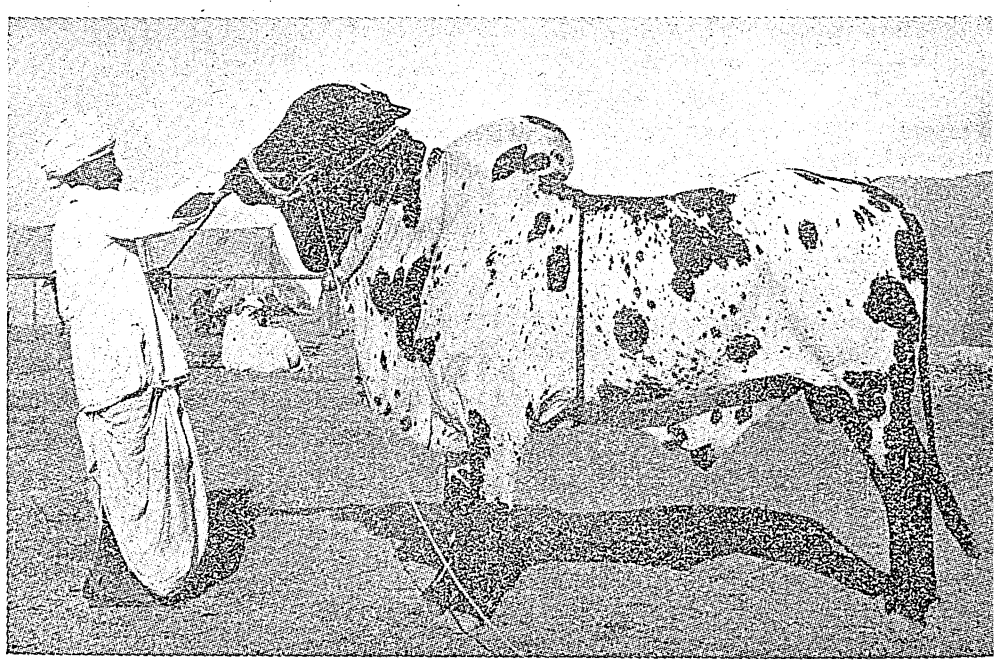
Using the methods evolved in the above investigations, trials of germinating cardamom seeds were conducted in the Khasi and Jaintia Hills in Assam, with seed supplied by the author from South India. Very good germinations up to 85 per cent were obtained in these trials with seeds sown in the warmer part of the year. The nurseries were raised at an elevation of 1,700 feet. However, a major part of these seedlings died during the succeeding winter season perhaps due to the severe cold, and probably frost, in these northern latitudes. The minimum temperature in the cardamom-growing regions of South India never goes down to this level, but remains at a much higher level.

It may, therefore, be suggested that in regions like Assam, cardamom nurseries may be raised at lower elevations at the foot of the hills. Even the elevations at which cardamom can be grown successfully to fruiting stage in regions like Assam have yet to be determined. The situation may be the same in the North-East Frontier Agency to which place also cardamom seeds have been supplied for trials.

News and Pictures



Above : His Excellency Mr. Chivu Stoica, Prime Minister of the People's Republic of Rumania, who recently visited India, is being shown round the Aarey Milk Colony in Bombay



Right : A spotted bull of the Deoni breed from Bombay State was one of the interesting exhibits at the All-India Cattle and Poultry Show recently held in Delhi

nice to know the nose !

TALKING about the nose reminds us of people talking through the nose, especially when they have a cold. This brings out an important function of the nose, which you may or may not be aware of.

It is this : the nose acts as a resonating chamber for the voice, controlling its tone and other qualities. That is why when you have a cold or your nose is blocked, your voice is so different.

The nose is for breathing. This reminds us that we should breathe through the nose and not through the mouth. The nose helps, if you breathe through it, to keep you free of infections of the throat and chest. It also regulates the temperature of the air that goes through it into the body.

Not known to many is this other function of the nose : it supplies moisture to the air breathed in so that the exchange of gases in the lungs may take place easily.

FOR SMELL

The nose is for smell. But, it is also to keep out harmful substances like dust and soot from getting into the body.

The nose is always associated with colds. When the cold is severe, the lining of the nose gets swollen. This blocks the nasal passage. The output of mucus also increases, leading to the running of the nose and a typical coarseness of voice. Then you call it a 'head cold'.

A head cold is, of course, temporary, but if it visits you again and again and you neglect it, then it becomes a chronic congestion, going by the name of nasal catarrh.

If you ignore this also, it becomes chronic, spreads to those small bodies of tissue in the nose called the adenoids which gets swollen and blocks the air passages. The inflammation may spread to the tiny tubes from the back of the nose to the mid-ear. Then comes deafness and running of the ears, so common in children.

A chronic catarrh may also spread to the tiny cavities of the bone in the face on either side of the nose. The blood stream may carry this infection to other parts of the body too.

All this goes to show that the nose needs nice care.

FOUL DISCHARGE

When a child in the house gets one-sided bleeding from the nose or a discharge with a foul smell, it is time the parent consulted a doctor.

And, when it comes to children, they have also another extraordinary ability : stuffing articles like stubs of pencils and pieces of paper up their noses. Naturally, they will have difficulty in breathing through the nose.

In many cases, children also can develop a foul-smelling discharge from the nose. Here again, this calls for the doctor's help. If a child breathes through the mouth, it is a symptom that something is wrong with the nose. May be, the nasal passages have been blocked by enlarged adenoids.

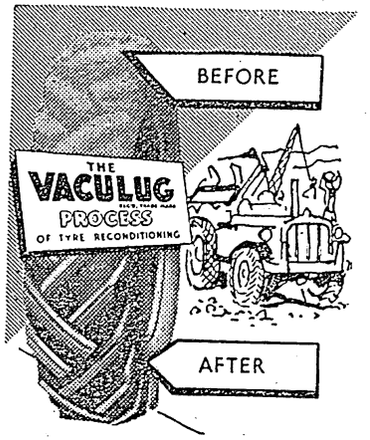
A FEW DON'TS

Apart from consulting the doctor in nasal ailments, you must know some no's about the nose.

Don't use drops, ointments and inhalers continuously unless the doctor has told you to do so.

Don't use strong antiseptic lotions for washing the nose.

The safest method would be to use a warm saline solution. This is made by dissolving half a teaspoonful of salt in a glass of warm, boiled water. Put it in the palm



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of your hand, sniff into each nostril, draw it into the mouth and spit it out.

You don't have to be a doctor yourself to prepare a nasal lotion. Take five grams of borax, five grams of soda bicarb and five grams of salt. Put them in five ounces of water and you have a good nasal lotion.

Don't blow both the nostrils at once, when you want to blow your nose. You are likely to push the infection of the nose into the ear this way. Better blow each nostril separately.

And remember, when you have a head cold, don't lose your head over it. Consult the doctor.

RAUWOLFIA ROOT

(Contd. from page 16)

plant hormones like Seradix and planted during the monsoon. Shoot cuttings have to be planted two feet apart in nursery-beds 40 feet long, four feet broad and six inches high. In two weeks of planting, cuttings put forth sufficient leaves. After four to six months, the plants begin to flower and form fruits.

Where irrigation facilities are available, plants can be also irrigated at fortnightly intervals during the hot months. In winter, one irrigation a month will suffice. It is desirable to provide overhead shade to plants during summer.

HARVESTING TIME

When the plantation is two years old, roots can be harvested. From such a plantation, you can get a yield of about 2,000 pounds of air-dry roots including fibrous roots. Under irrigated conditions, a three-year old plantation can yield about 3,000 pounds per acre.

Some growers either do not dig out the fibrous roots or, if they do, they throw them away. These roots also contain a good quantity of alkaloids and, hence, they also should be collected and marketed.

With the present shortage of the drug, it may even be worthwhile marketing stems, leaves and even inflorescence because all these contain fair amounts of alkaloids. Sometimes, flowers and tender fruits are attacked by the flies which suck their sap. Dusting ten per cent BHC dust will control the pest.

Finally, the tendency on the part of some growers to plant on a commercial scale by vegetative propagation is to be warned against. It is not economical to do so, and the best way would be to raise the plants in compact areas and collect seeds which may then be used for raising plantations.

READERS WRITE

SOWING GARLIC

In this part of the country, we plant bulbs to raise a crop of garlic. It takes about Rs. 300 to plant an acre. We are told it would be cheaper to sow seeds. Can you throw some light on this problem ?

—Gurcharan Singh,
Manager, Preet Nagar Farm,
Preet Nagar (Amritsar)

IF garlic bulbs are purchased at sowing time, the cost of seed per acre will certainly amount to about Rs. 250, because then the price of garlic is very high. Storage of garlic is rather easy and it will be worthwhile storing selected garlic bulbs for sowing next season. This will not only mean a saving in the cost of seed, but also assure the farmer of good seed. Soon after harvest of the crop, garlic bulbs sell at Rs. 12 to 15 per maund and those who did not raise a crop of their own may purchase the bulbs then and store them.

Garlic plants do produce bulblets (sets) in the leaf-axils which can be sown. But they are not very many and utilizing them for seed purposes is out of question. Garlic plants do not set seed and so the question of sowing them for raising the crop does not arise.

COTTON-GROWING

IN THE Thasra taluka, cotton occupies the maximum acreage of 29,000 acres among the crops grown. Since cotton has been found to be better-paying than other crops, farmers have been growing the crop year after year. In recent times, apart from a gradual decrease in yield, there has been a greater incidence of disease, especially of root rot, as a result.

The disease is found attacking cotton in September and October when the temperature is high, the damage getting reduced thereafter as the temperature goes down.

Last year, Shri Fulabhai Zaverbhai Patel, a progressive farmer of Rampura Tabe Sui of Thasra taluka, tried to overcome this disease through changes in the practices followed in growing cotton. This is what he did.

He sowed the crop in lines six feet apart. Before sowing, he applied ten cartloads of cattle manure, 20 tons of nitrogen and ten pounds of phosphate per acre in the form of fertilizers. The nitrogenous fertilizer was given in two instalments—one at sowing by mixing with the seed and the other after six weeks of sowing. The fertilizer consisted of ammonium sulphate and castor oilcake in the proportion of 1:4.

In applying the second dose of the fertilizer, instead of broadcasting it he opened furrows along the crop-line four to six inches away and applied the mixture. This not only helped him to economize on the fertilizer but made it easy for the crop to absorb it.

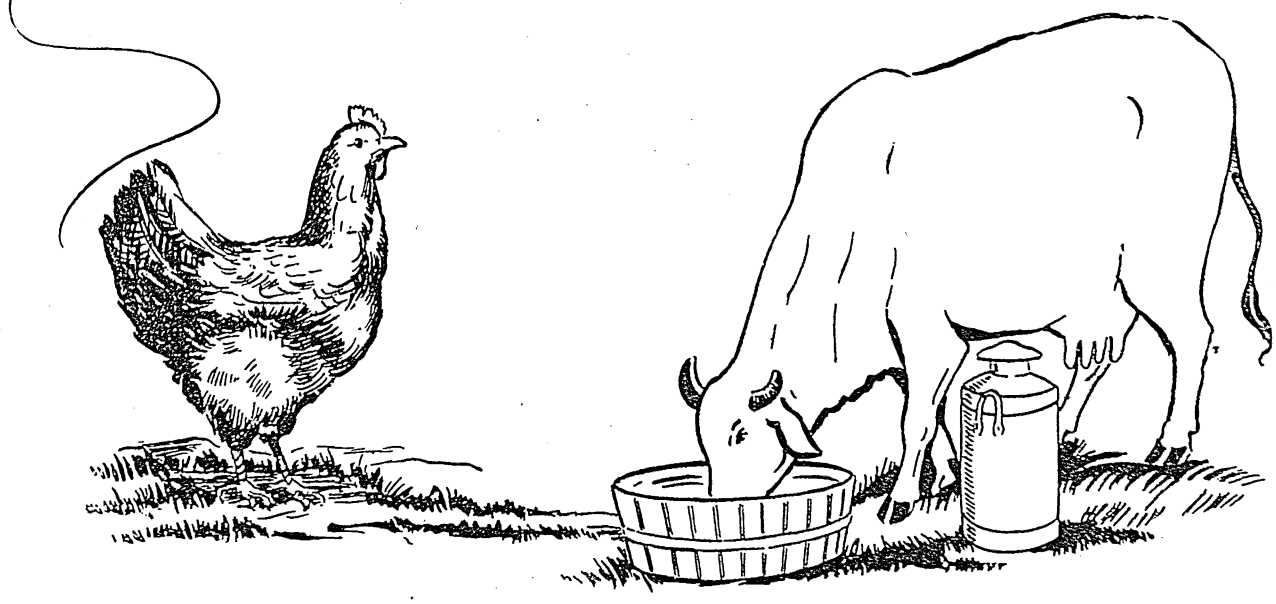
Between the lines of cotton he raised an intercrop of *jowar* for fodder.

Moreover, he sowed the cotton in-between the lines of the crop he had sown the previous year, which meant that he had changed the location of the cotton crop in the field without changing the field itself. In addition, he had the intercrop of *jowar*.

With this method, Patel obtained 960 pounds of cotton per acre as against the normal 360 pounds. It was also found that with this type of cultivation the disease infestation had also gradually decreased year by year; at least it is no longer to be seen in the cotton crop in his fields.

—P.N. Parmar
Mamlatdar
C.B.D.O.
Thasra

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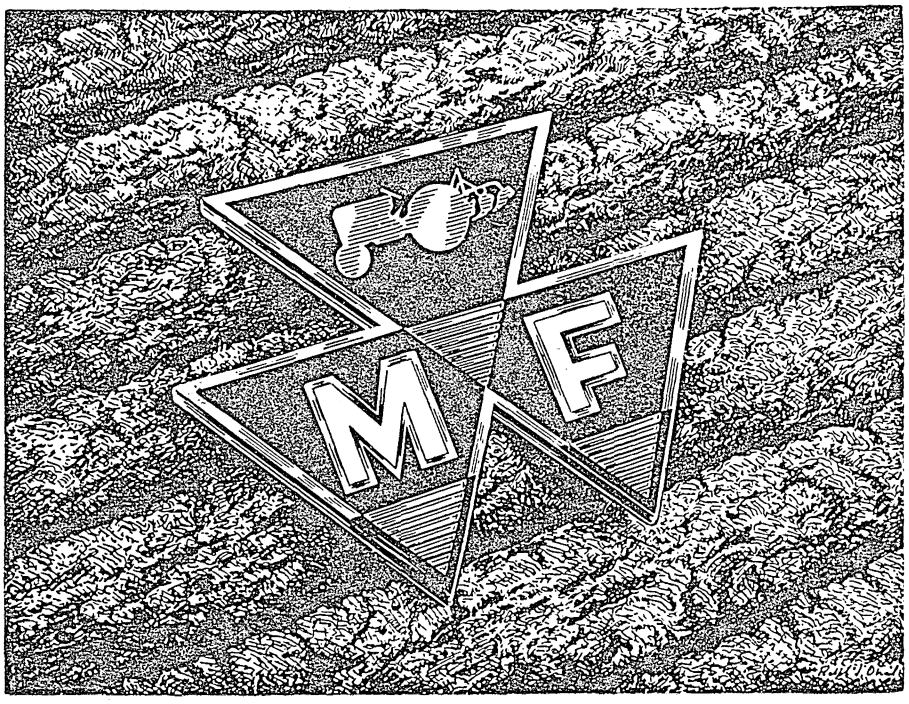
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OUR COVER



This summer, more farmers in the Punjab have been treating their wheat seed against loose smut and Earcockle diseases. A disease free crop will mean a fuller crop, as in the picture above, that more than repays for all the labour put in for it

Photo by H.K. Gorkha

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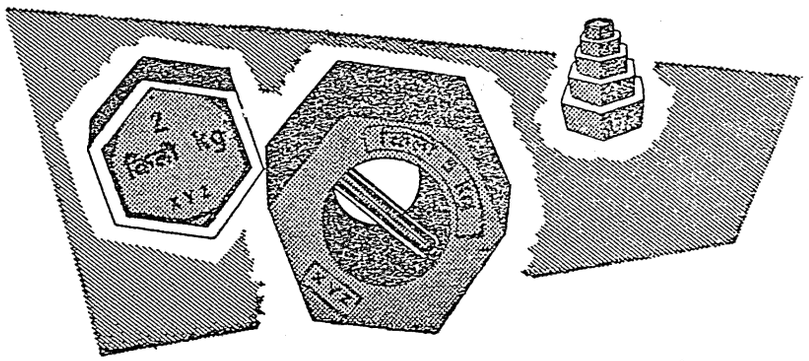
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CHANGING OVER TO

THE METRIC SYSTEM



India has at present no common system of weights and measures. There are not less than 143 systems in use. This multiplicity gives room for malpractices. The introduction of a uniform system throughout the country based on Metric Weights and Measures will be very convenient and make calculations extremely easy, especially because the country has already adopted the decimal coinage. The Standards of Weights and Measures Act, 1956 has laid down the basic units under the metric system. The reform will be gradual so as to cause minimum inconvenience to the people.

Even after its introduction in an area or a trade, the traditional weights and measures will be permitted to be used for a period of three years.

THE CHANGE-OVER TO THE METRIC SYSTEM OF WEIGHTS AND MEASURES BEGINS FROM OCTOBER, 1958

KNOW THE METRIC WEIGHTS



The unit of weight is the KILOGRAM = 1 seer 6 tolas (or 86 tolas.) or 2 lb. 3 ozs.

SUB-UNITS

10 milligrams = 1 centigram
10 centigrams = 1 decigram
10 decigrams = 1 gram
10 grams = 1 decagram
10 decagrams = 1 hectogram
10 hectograms = 1 kilogram

MULTIPLES

100 kilograms = 1 quintal
10 quintals or 1,000 kilograms = 1 metric tonne

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THE CROP WITH A FUTURE

IN a recent Sugarcane Committee meeting, Shri Ajit Prasad Jain, Union Minister for Food and Agriculture, had occasion to remark: "Our present production of sugarcane is 25 per cent of what it should be."

WE are now the largest sugarcane-producing country in the world, but produce a meagre 15 tons to the acre; Hawaii produces 62 tons to the acre, Java, 56, Japan and Formosa, 28 and Puerto Rico, 24.

INDIA is certainly ahead of other countries in sugarcane research, especially in breeding better varieties. Already, 95 out of 100 sugarcane farmers in the country are growing the improved *Co.* varieties. But what is needed is to apply the other results of research to sugarcane-growing and thereby intensify cultivation further.

DEVELOPMENT schemes initiated by the Indian Central Sugarcane Committee have already covered 16.75 lakh acres, or 30 per cent of the total sugarcane area in the country.

HOW these schemes can help individual farms step up per-acre production has been seen in one programme that was taken up in 1954—the intensive manuring programme. In 1957, this programme had covered 15.4 lakh acres, and had as its aim application of chemical fertilizers to the sugarcane crop. Wherever this was taken up, yields recorded a nine to 37 per cent jump.

FOR the current year, the target for this programme has been kept at 20 lakh acres; the entire sugarcane area is to be covered by the end of the Second Five Year Plan.

THE chain of sugarcane research stations set up is testing new and better sugarcane varieties evolved by the Sugarcane Breeding Institute at Coimbatore, and finding out suitable cultural, manurial and irrigational schedules for the crop in the different regions, in addition to evolving suitable measures for controlling pests and diseases of cane.

Sugarcane growers would benefit by adopting these schedules on their farms, as sugarcane is a crop which has a good future.

BEES WORKED FOR RESEARCH

SOME years back, when the Bombay Department of Agriculture wanted to multiply the seed of *D-IX*, a variety of sannhemp resistant to the wilt disease (*Fusarium oxysporum* f. *udum* S. and H.), it came up against a practical difficulty.

SANNHEMP is an almost self-sterile plant, and in nature, is cross-pollinated by bees.

So the plant breeders hit upon a novel plan at the Agricultural College Farm in Poona. Seeds of the wilt-immune strain were sown in small plots measuring four feet x four feet, and when the plants were about to flower, they were enclosed in large muslin cage which completely covered the crop.

BEES busy visiting a sannhemp crop on the College Farm were caught, given a good cleaning with a jet of water to remove the pollen and kept in small insect cages for 24 hours to allow the pollen to germinate and become 'non-viable.'

The bees were then introduced into the muslin cages, where they actively pollinated the sannhemp flowers.

Pure nucleus seed of the wilt-immune seed was thus produced.

Well Cared For Silkworms Spin Better

by
M.G. Kamath



Basith stands near one of his local mulberry selections

YOU may or may not have heard of the word 'renditta,' but those in the silk trade commonly brandish this word whenever they discuss each other's achievements. It merely means the number of pounds of cocoons needed for producing a pound of silk.

I heard this word from Shri Abdul Basith, a silkworm-rearer-cum-silk textile man, when I visited his mills at Vadanganahalli, near Bangalore City.

"In Japan, the land where silkworm raising is getting to be an art, the renditta is six to seven," Basith explained, "and in our own silk areas it averages 18 to 20."

JUST SATISFACTORY

Many had attempted to bring this down as near the Japanese renditta as possible with some success and, in his own case, he said, he had a satisfactory 11 to 12. "Satisfactory, but still room for improvement," was his comment.

In the silk industry, he told me, the availability of quality cocoons contributes substantially to the margin of profit obtained from the finished textiles.

How he got interested in renditta, he told me thus.

As a struggling silk textile man with four looms to be kept busy (that was eight years ago), he



Plucking choice mulberry leaves for the silkworms to chew

thought that the best way of bringing down the cost was producing the cocoons and not buying them.

He then bought the ten-acre rock and gravel around his mills, and started growing mulberry and raising silkworms. He ploughed the profits from the mills back into the mulberry garden—with good results.

HELPFUL FACTORS

Asked how he was able to accomplish the 11 to 12 renditta, Basith listed the factors that made it possible as:

good and hygienic rearing conditions,
a smaller number of worms per rearing tray,
timely feeding, and
good leaf feeding.

The last one he elaborated as: "Good leaf is probably more nutritious and helps worms grow better, spin better." And good leaf feeding depends on good leaf raising.

Basith first tried local mulberry bushes. Then he obtained a few Japanese graft mulberries, superior in leaf and leaf yield than the local.

Of the about 200 local trees planted, he found the leaves of two to be as good in size as the Japanese ones. He gave special care to these two and propagated them further.

HIGH MULBERRY YIELDS

Sometimes, the mulberry yields went up to 25,000 pounds to the acre. His best when he had started was round about 12,000 pounds.

Asked what special attention he gave to his mulberry, he replied, "Nothing special. Only, I am regular in applying manures to the crop, and irrigating and pruning it.

"I manure the crop with farmyard manure, just as other mulberry growers do. I irrigate the crop once a week. I have installed motors on the three wells I have.

"And, I prune the plants once a year."

With good and hygienic rearing conditions, he gets 600 pounds of cocoons a month.

GOOD QUALITY

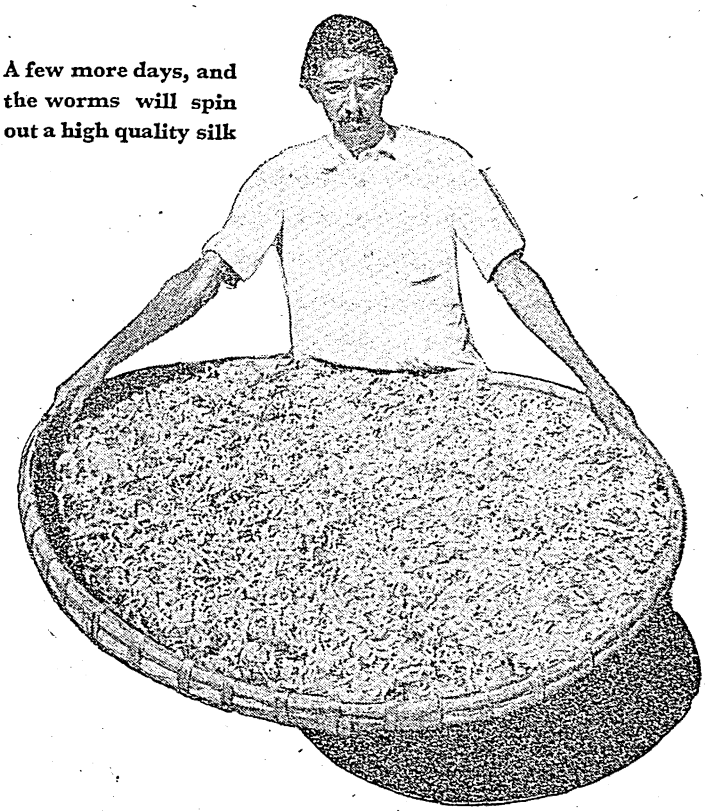
The quality was so good that he was able to utilize the silk for manufacturing chiffons, he said.

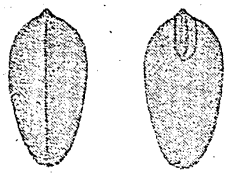
I complimented Basith on his three-in-one combination of mulberry-silkworm-textile mill, and asked whether all the cocoons he needed he produced in his area.

"Oh, no," was his reply. "Over and above what I produce here, I still buy my requirements."

"But," he proceeded, "I have seen for myself that if one is interested, one can surely make a success of silkworm rearing."

A few more days, and the worms will spin out a high quality silk





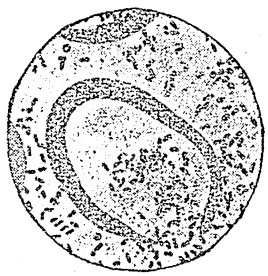
Normal wheat grains

and



Earcockle galls (both magnified)

IT IS EASIER THAN YOU THINK TO GET RID OF THE BOTHERSOME TWO ON WHEAT:



An Earcockle gall as seen under a microscope — eelworms along with their eggs

LOOSE SMUT and EARCOCKLE

by

Arjan Singh and **Kishan Singh Bedi**

Director of Agriculture **Plant Pathologist**

Punjab

FOR the last six years, wheat farmers in the Punjab are being shown how they could get rid of the loose smut and Earcockle diseases of wheat.

In the State, wheat is the most important staple food crop, being grown on over five million acres. The two diseases considerably reduce the grain yield of this valuable crop.

In 1957-58, the damage to the wheat crop due to loose smut alone ranged from two to 30 per cent in various areas. Even at a conservative figure of five per cent, it meant that the farmers lost three crore rupees worth of wheat.

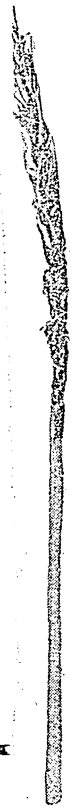
Fortunately, the two diseases can be controlled by very simple methods, which cost next to nothing to the farmer.

LOOSE SMUT

Loose smut, which is caused by the fungus *Ustilago tritici* (Pers.) Rost., destroys the wheat ears completely, turning them into a black, loose powder consisting of millions of very small spores (seeds) of the fungus. When such black heads come out, the smut powder is blown about by the wind and infects the developing grains in healthy ears in the field. The grains which are infected mature normally and cannot be distinguished from the healthy ones.

These healthy-looking, but actually infected grains when sown give rise to ears containing the black spore masses of the smut fungus which again can be blown about by the wind to infect the developing grains.

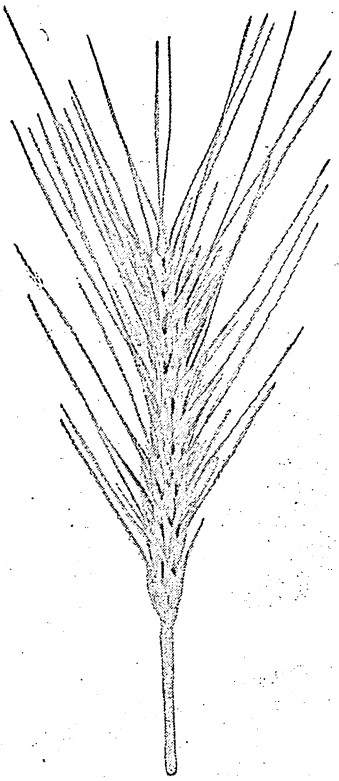
Thus, the disease continues year after year, the extent of its infection depending on the weather conditions at the time of the flowering of the crop.



A smutted ear of wheat. See how the grains have been replaced by the black spore masses of the fungus



The rachis of a smutted ear left naked after the spores have been blown away by the wind



But for the smut, the wheat ear would have been this

To destroy smut infection, an easy method is recommended. It makes use of the sun's intensive heat which is in plenty in the plains of the Punjab. It is even effective in the comparatively warmer parts of the hilly Kangra district.

SOLAR TREATMENT

The method is this. Wheat seed is soaked in ordinary clean water taken from wells, tanks, canals, waterworks, or any other source. The soaking is done for four hours, from 8 a.m. to 12 noon on any bright sunny day during May-June, or before the rains commence.

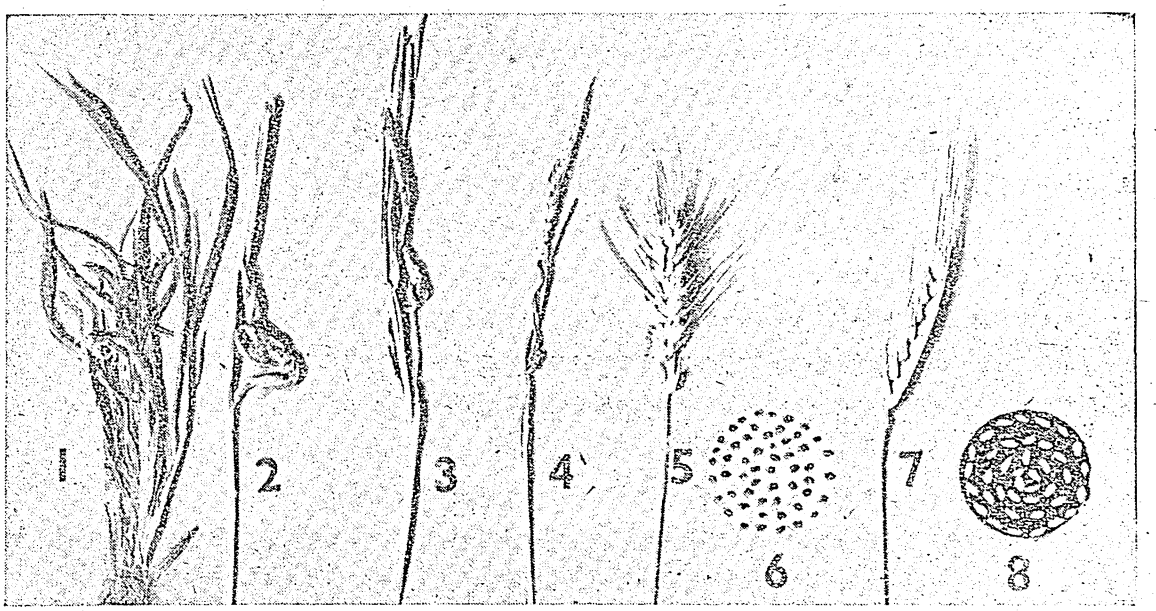
After soaking, the seed is spread out in the sun in a thin layer on a tarpaulin, sheets of cloth or Hessian, *khesis*, or ordinary household sheets, or any other cloth, and dried completely.

It is seen that in the Punjab plains, the seed gets quite dry in about six to seven hours, if the drying is done from 12 noon till about sundown. When the seed gets cool in the evening, it is put into bags and stored till needed for sowing in October or November. Care has to be taken, however, that the seed is perfectly dried before bagging. Otherwise, it will go bad in storage.

To save the seed from insect pests in storage, BHC dust at one *chhatak* per maund of seed should be mixed with it. A maund of seed needs about 16 square yards of ground space to dry perfectly. Such a space should not have a grass or any other vegetative cover.

Tarpaulins, or cloth, or Hessian sheets should be spread out on the bare ground at about 11-30 a.m. By the time the soaked seed is spread out on these they would have acquired the temperature of the ground. It is important that sufficient ground space is provided for drying the seed.

For soaking the seed, no special equipment is needed. Ordinary tubs, buckets, juice-boiling pans, clean kerosene oil tins, earthen pitchers, or any other vessels may be used. If any of these is not available, a gunny bag can be used which can be half-filled with seed, lowered into the water in a tank and kept there for the specified period for the water to soak in.



Damage done by Earcockle to:

1. a young wheat plant and

2. an emerging ear

In 3 and 4 the disease has reached its gummy stage, gluing together the glumes and awns

5. Divergent glumes and awns in an Earcockle-affected ear

6. Earcockle galls

7. A normal, healthy ear and

8. grains of wheat

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EARCOCKLE

The Earcockle is the second disease of wheat. It can also be controlled very easily. In the Punjab, it goes by such names as *mamni*, *gegla*, *dhanak*, *matwa tannan* and *tandu*. It occurs all over the State, and is partly serious in the districts of Kangra, Rohtak, Gurgaon, Hissar and Karnal, where up to 50 per cent damage has been noticed in some fields. Taking the State as a whole, the damage can be put at five per cent.

When the disease appears in young plants, wrinkling, rolling and distortion are seen in the leaves. As such, the plants look bushy. If the disease infection is severe, plants die at this stage.

Later, a bright yellow gummy or slimy substance develops on the stems, leaves and ears. Often, the stems and ears get distorted. Ears covered with a yellow slime do not develop any grain in them. On drying, they form a hard, brittle mass.

Many diseased plants, however, do produce ears which are greener and remain green longer than the normal ears. In such ears, hard, dark-coloured galls develop in place of normal grains. The galls vary in size, from that of the normal wheat grain to as little as 1/6th its size. The Earcockle galls, as these are called, can be mistaken for wheat seeds. In fact, the very name earcockle is due to the fact that these galls resemble the seeds of the cockle weed found in European countries.

HARD GALLS

The galls are hard, have a smooth surface and are difficult to break. They are lighter than water, however, and hence float when put into water. Unlike wheat grains or wheat seeds, the galls do not have any embryo in them. They have thick walls, and their inside is full of a yellowish white mass consisting of numerous minute thread-like structures which can be seen even with the naked eye, and very well with a hand-lens.

The Earcockle galls, can also be told from wheat seeds by placing them in moist soil. The wheat seeds will germinate and give rise to seedlings in course of time, while the earcockle galls will not.

The disease is due to a parasitic nematode or eelworm (*Anguillulina tritici*)(S.)G. These eelworms enter the ovaries of wheat flowers, which form hard, dark-coloured galls instead of grains. The wheat crop is harvested along with these galls, and when the produce is used as seed, the disease appears again on the crop.

When the wheat seed containing Earcockle galls is sown, the galls decay and the eelworms come out into the surrounding soil. When these come into contact with the young wheat seedlings, they move up between the leaves of the growing bud, and are carried up with the young bud as the stem grows in height. In many plants, they infect the foliage leaves and produce wrinkling, curling and distortion. Badly infested plants die early.

GUMMY PHASE

Later on, because of the injury caused by the eelworms to the leaves and the ear, the plant sap comes out. From this sap, a yellow slimy substance is formed which glues the leaves and glumes in the ears. This is the gummy phase of the disease.

In many plants, the eelworms which have gone up between the leaf-sheaths near the growing points of the culms remain in this position till the ear is formed. And, when the ears are formed, they enter the ovaries and lay eggs. The old worms die and the eggs hatch. The new worms hatching out lie dormant till the galls are mature. In this condition, they are able to remain dormant for many years till the galls are sown again along with the wheat seed.

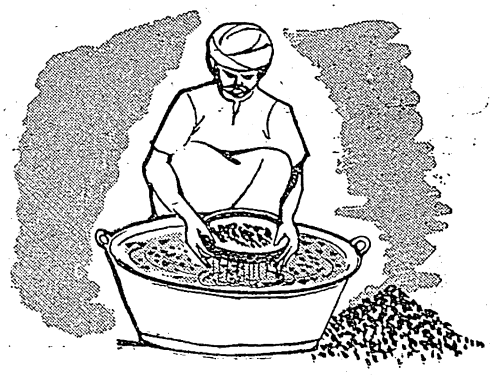
The most effective method of getting rid of Earcockle, therefore, is by separating out the galls from the wheat seed. For this, the seed is floated in water. The wheat grains sink while the galls float.

The separation of the galls from the wheat seed is done easily this way. Put the seed in ordinary clean water in tubs or iron pans, or any other open vessel like a drum or a bucket. Immediately after, agitate the seed vigorously with the hands for about five minutes. The Earcockle galls, being lighter than water, will float on the surface from where they can be skimmed off with an ordinary sieve like the one used for sifting flour. The galls thus separated out should be destroyed, preferably by burning. A few minutes' immersion of the wheat grain in water will not wet its inside, and whatever moisture is there on its surface can be easily removed by drying it in the sun before storing. In case the treatment is carried out just before sowing, the seed need be only air-dried.

IN COMBINATION

For the past six years, the solar treatment against loose smut and the floatation method against the Earcockle disease are being undertaken in combination during May-June. Since for treating against loose smut the wheat seed has to be soaked in water, Earcockle galls are removed with a sieve immediately after the seed is put into water and the floating galls removed within the first five minutes. A caution here. Some of the galls when allowed to float for a longer period would sink, and thus escape removal.

Nearly four lakh maunds of wheat seed have been subjected to the solar treatment and about 4,31,000 maunds of seed freed from Earcockle galls during the last six years. Seed free of these two diseases is estimated to have been sown over six lakh acres in the Punjab, bringing an additional profit of 40 lakhs of rupees to farmers.



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We have, however, still a long way to go before we can save the annual estimated loss of three crores of rupees due to these diseases. Hence, till the two diseases are completely stamped out, May and June are going to be the campaign months in the Punjab for intensifying the control operations.



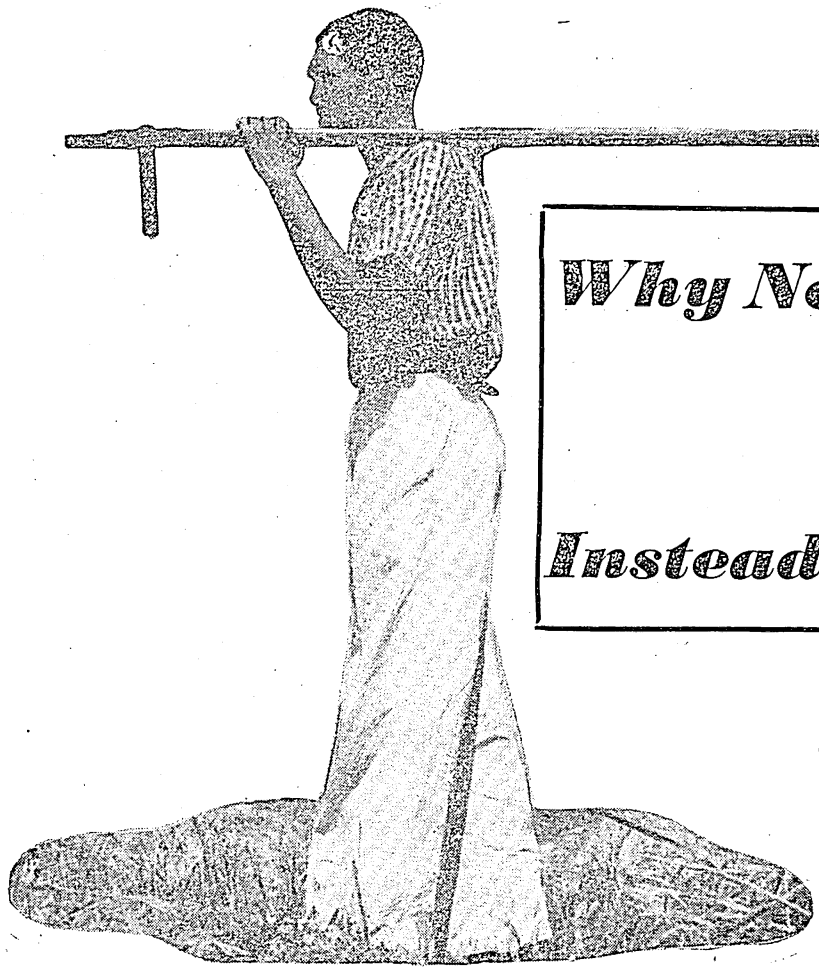
During these two months, a 'Loose Smut cum Earcockle Control Fortnight' is being observed all over the State. Every farmer in every village in the National Extension Service and Community Development Blocks will be told to treat his wheat seed. This is being done by the Agriculture Department in close co-operation with the Block Development Officers and Village Level Workers. Each Village Level Worker spends at least two days in the village of his circle, and through the assistance of the local *panchayat* and village leaders gets the actual control operations carried out by every farmer in the village. On the evening before the operation, farmers are told of the nature of the two diseases, the methods of their spread, the extent of damage caused by them and the control methods.

Last year, a small-scale campaign of this kind had been taken up in the Ludhiana Community Development Block with great success. The campaign is now being put on a State-wide basis with a target of treating seed which would be sufficient to cover at least 33 per cent of the area to be put under wheat during the next season. The campaign is expected to yield very good results.

Why Not a Scythe Instead of the Sickle?

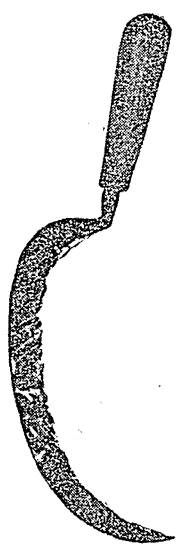
by

R.P. Singh, J.S. Manku and Hans Kumar
Indian Agricultural Research Institute
New Delhi



No burden at all to shoulder: this Austrian scythe is light and easier to operate

A sickle having serrated edges

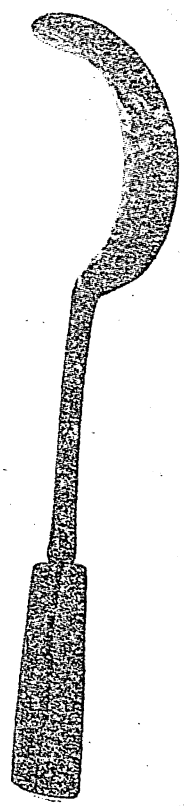


AT the Indian Agricultural Research Institute, New Delhi, a suitable substitute for the sickle is being searched out. This substitute is to be a time and labour-saving implement, easy to operate, capable of giving a good outturn and repairable by a village artisan.

Throughout India, the sickle is the implement commonly used for harvesting field crops or cutting grasses. The sickles in use in the various parts of the country vary in shape, size, thickness and curvature of the blade. Some have plain cutting edges while others have edges serrated like the carpenter's saw. Basically, however, the tool remains the same.

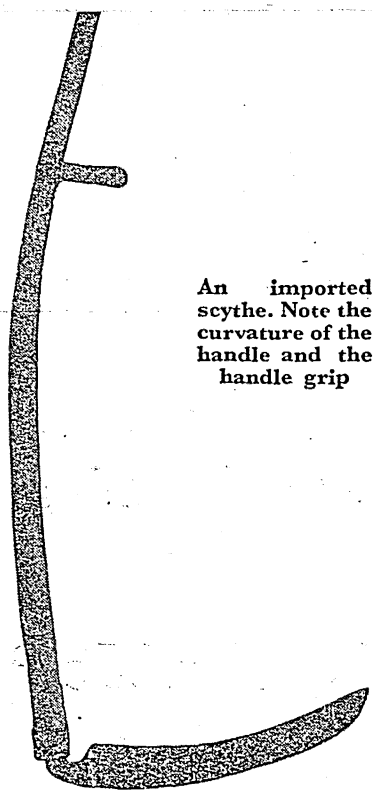
The sickle is made locally by the village artisan, the cost varying from a rupee to two rupees. The only maintenance needed is the occasional sharpening of the blade or fixing of the handle.

A plain-edged sickle



TIRESOME JOB

Working with the sickle is a hard and tiresome job, as the worker has to move forward while harvesting the crop. Working continuously for eight hours a day, a worker can hardly harvest 1/5 to 1/6 of an acre.



An imported scythe. Note the curvature of the handle and the handle grip

When the time for harvesting and threshing is limited and there is a general shortage of labour, one feels the need for a harvesting implement, simple and easy to operate but better in performance.

At the Institute, a few scythes were imported for trial from the United Kingdom and other European countries, where these are universally used for harvesting crops and cutting grasses.

WORKING COMPARED

The scythe consists of a steel blade sharpened at one end and fixed to a handle, or the snath. The shape and size of the snath as well as those of the blade vary from country to country. Scythes from England, Sweden and Norway received at the Institute were tested for cutting field crops and fodders like berseem and grass. Their working was compared with that of a sickle by simultaneously putting one man to work with a scythe and another with a sickle for cutting oats.

The observations made on six plots, each measuring ten feet × ten feet, are given below.

Trial No.	*Implement*	*Time for cutting*		*Percentage of stock-cut*
		Minutes	*Seconds*	
1.	Scythe	3	15	89
	Sickle	6	15	
2.	Scythe	3	10	91
	Sickle	7	15	
3.	Scythe	3	00	87
	Sickle	7	20	
Average time required per acre:		scythe	22 hours 45 minutes	
		sickle	49 hours 36 minutes	

The same year, similar observations were made on the working of the sickle and the scythe in cutting berseem.

Trial No.	*Implement*	*Time taken*		*Percentage of stock-cut*
		Minutes	*Seconds*	
1.	Scythe	3	30	82
	Sickle	17	00	
2.	Scythe	3	45	85
	Sickle	18	00	
3.	Scythe	4	00	87½
	Sickle	15	00	
Average time required per acre:		scythe	6 hours 48 minutes	
		sickle	25 hours 30 minutes	

Scythes and the sickles were operated simultaneously in trials for comparison

In the following year, trials with the scythes were continued for cutting oats. For this purpose, six plots of 22 feet × 22 feet were taken. The sickle was tried in one of the plots for comparison. The observations made are shown below.

Trial No.	*Implement*	*Time taken*		*Percentage of stock-cut*
		Minutes	*Seconds*	
1.	Sickle (used for comparison)	12	00	
2.	Scythe	9	00	88
3.	Scythe	8	45	84
4.	Scythe	9	15	83½
5.	Scythe	8	00	82
6.	Scythe	9	00	83
Average time required for one acre:		scythe	13 hours 30 minutes	
		sickle	18 hours 00 minutes	

In these trials, it was seen that all the scythes received from the European countries were rather heavy and would fatigue an average person working them.

Work without stopping would require plenty of stamina in the worker. The handles of the scythes were quite heavy and, because of their shape and curvature, they needed special techniques for an efficient operation. There was no doubt, however, that the scythes were superior to the sickle in output, as a larger area could be covered with them in a given time. But, in view of the working of the scythe being tiresome, its introduction and popularization were not taken up.

AUSTRIAN SCYTHES

Subsequently, efforts were made to find out a scythe which would be lighter and easier to operate. Six scythes received from Austria were next taken up for trial. Four of these were identical in shape and design, and two were of a different shape. The specifications of the scythe blades are shown below.

No. of scythes	*Length of blade in centimetres and inches*	*Sweeping cut*	*Weight of each (ounces)*
4	29 inches or 73.75 centimetres	26.75 inches or 68.00 centimetres	16.5
1	23.5 inches or 58.5 centimetres	21.5 inches or 54.5 centimetres	10.5
1	15.5 inches or 39.5 centimetres	12.75 inches or 32.5 centimetres	15.00

Only one handle had been provided for using all the six blades. This handle was straight, 63.75 inches long, and was made of good seasoned light wood. Two grips provided on the handle made the operation of the scythe easier.

These scythes were comparatively lighter than the previous ones tried. We had also received small grinding stones for sharpening the blades. These could be easily accommodated in the pocket of the operators.

These scythes were tested in cutting berseem and harvesting oats in 1957. The observations made are given below.

OATS

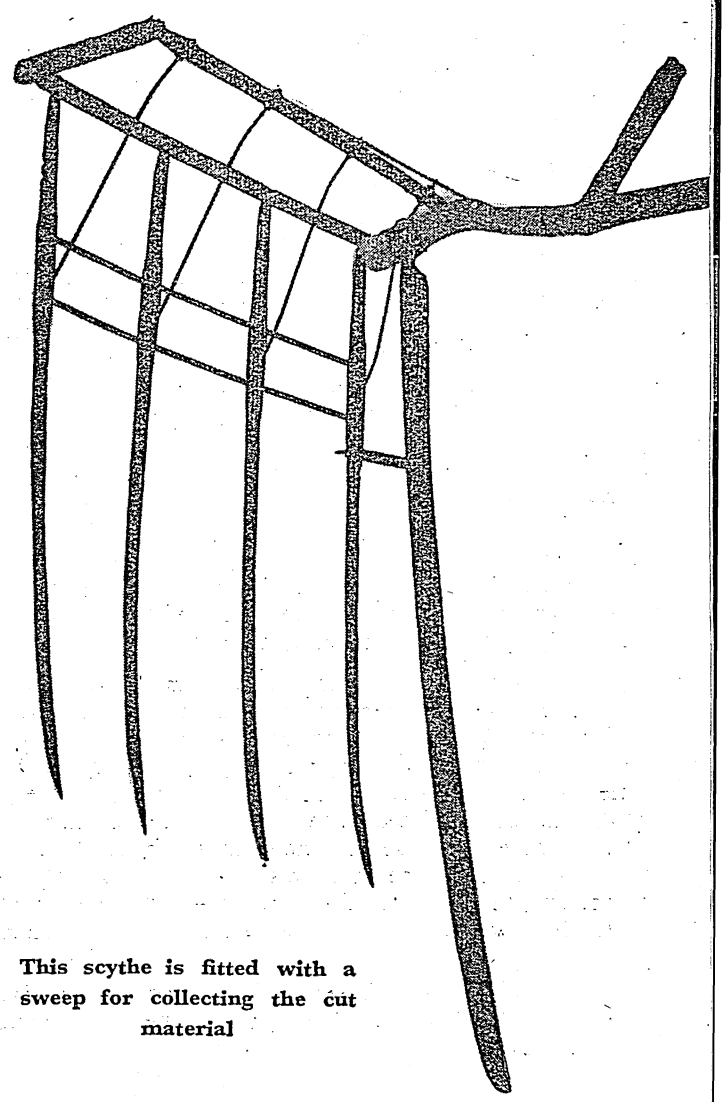
Trial No.	*Implement*	*Time taken* *Minutes*	*Area*	*Percentage of stock cut*
1.	Sickle (used for comparison)	90	60 feet × 60 feet	85
2.	Scythe	35	„	86
3.	Scythe	40	„	88
4.	Scythe	34	„	88
5.	Scythe	34	50 feet × 60 feet	88

Average output of a sickle in one hour:	0.050 acres
Average output of a sickle in eight hours:	0.400 acres
Average output of a scythe in one hour:	0.140 acres
Average output of a scythe in eight hours:	1.120 acres

BERSEEM

Trial No.	*Implement*	*Time taken* *Minutes*	*Seconds*	*Area*	*Percentage of stock-cut*
1.	Sickle (used for comparison)	210	00	30 feet × 100 feet	86
2.	Scythe	25	00	„	86
3.	Scythe	26	00	„	85
4.	Scythe	4	42	45 feet × 45 feet	86
5.	Scythe	5	15	45 feet × 36 feet	86

Average output of a sickle in one hour:	0.013 acres
Average output of a sickle in eight hours:	0.104 acres
Average output of a scythe in one hour:	0.162 acres
Average output of a scythe in eight hours:	1.29 acres



This scythe is fitted with a sweep for collecting the cut material



An Austrian scythe when used in an oats fiel l increases the output considerably

In all these trials, it was clear that sufficient practice was needed to work the scythe effectively. The stock-cut depended largely on the amount of practice the operator had with the scythe. The more experience he has the better would be the sweep of the blade near the ground. The nature of the ground was also seen to contribute to an efficient operation of the scythe. If the ground was level, without any contours, cleaner cuts could be had.

The crop harvested with a sickle is normally held with the hand, and, hence, piling of the cut crop can be done with the ear or grain portion of the plant arranged from one side of the bundle. But with the sweeping motion of the scythe the crop harvested is scattered in the field. With some practice, however, the operator could manage the harvest without much of scattering. Whether a sickle is used or a scythe, the harvested crop has to be collected over by the operator by stopping harvest, or by a second person.

In the trials, it was found economical to engage two men—one for operating the scythe and the other for collecting the harvested crop simultaneously, and to change over their work with each other from time to time. This way, with an Austrian scythe, an acre of oats could be harvested in seven hours and ten minutes, and an acre of berseem fodder in six hours and ten minutes. If only one man was engaged to cut as well as collect the material, about 30 to 40 per cent of the total time was required for collecting the harvested material.

The Austrian scythe seems to be very promising, and it looks as if scythes have a good scope for introduction into India.

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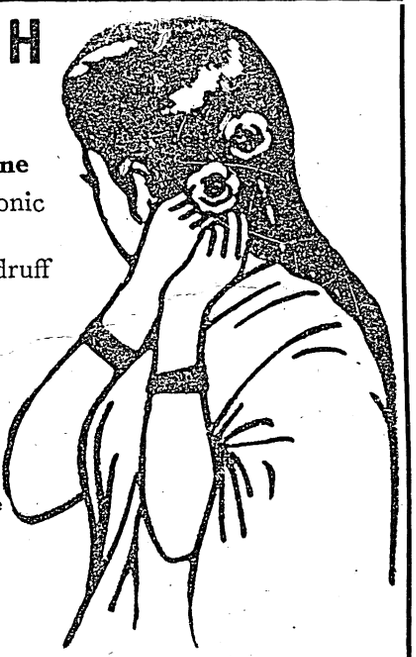
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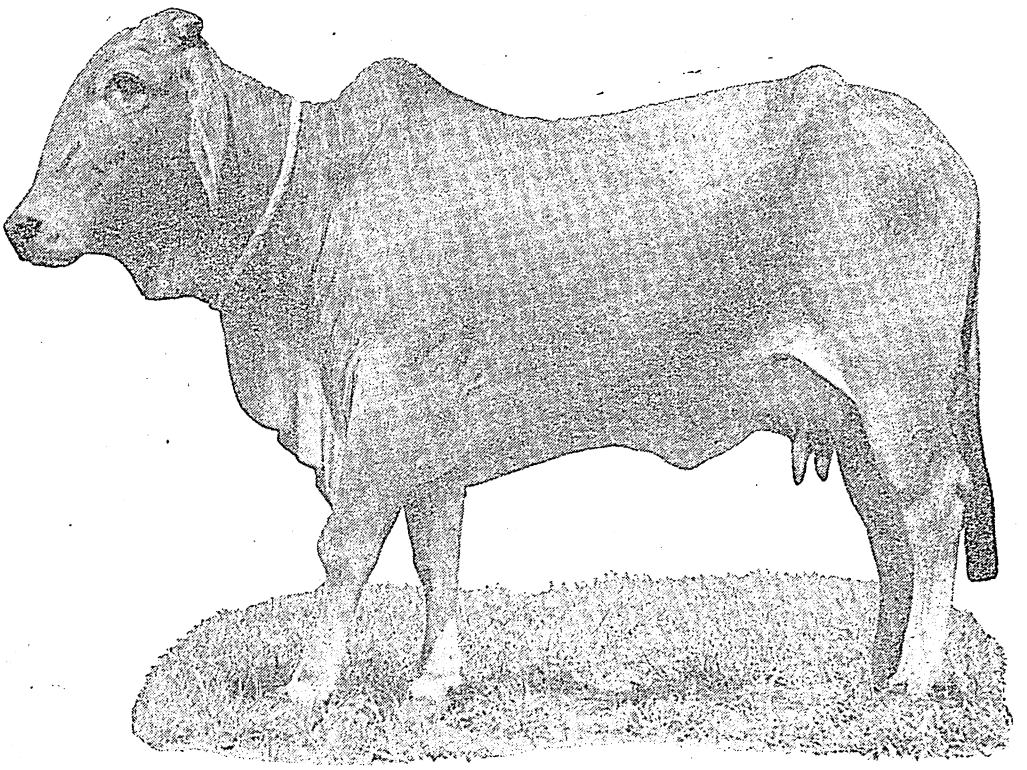
SHRI RAMTIRTH YOGASHRAM

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BOMBAY-14

Research Note

THE STERILE COW THAT DIDN'T REMAIN DRY



Afelbir, the Sahiwal cow, which yielded 7,145 pounds in 306 days—without getting pregnant

by
Gian Singh and Gurcharan Singh
Indian Agricultural Research Institute
New Delhi

IN India, sterile cows offer a special problem to the cattle breeder, particularly at a time like the present, when all-round efforts are being made to improve the cattle wealth of the country.

In foreign countries, sterile cows are given necessary treatment for a reasonable period. If this is not successful, they are slaughtered, as it is highly uneconomical to maintain such animals. But, such a disposal obviously cannot be adopted in our country. Most of the incurably sterile cows, therefore, have to live to their natural end.

There is, however, a possibility of artificially inducing milk in sterile cows who do not respond to any treatment for a natural conception. The development of the udder and the induction and maintenance of lactation in a cow are closely linked with the presence of several hormones in her system. Recent investigations have shown that by hormone administration it is possible to artificially bring about conditions that produce milk in cows without their getting pregnant. Luktuke mentions that in experiments conducted at the Indian Veterinary Research Institute, Izatnagar, a Hariana cow yielded 2,324 pounds of milk in 343 days, with a peak yield of 11 pounds.

At the Indian Agricultural Research Institute, New Delhi, artificial lactation was tried with success in the Sahiwal cow, Afelbir.

DECLARED INCURABLE

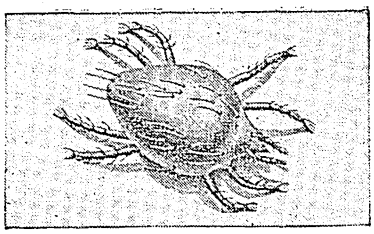
This cow was born on 9th October, 1948. Her age at the first calving was three years and 16 days, and she gave 8,375 pounds of milk in 306 days in her first lactation. After this calving, she did not come in heat for six years, though she was given the usual treatment. Her ovaries were cystic, and she was declared incurable due to endocrine imbalance.

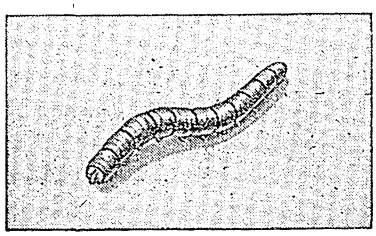
On 24th September 1956, three "Oestrogen" tablets of one gram each were implanted subcutaneously at the right region of the neck, and the wounds were dressed antiseptically. After about a fortnight, some sticky material appeared in the teats, followed by a few ounces of milk daily for about a month. As she did not respond satisfactorily, she was given a course of 15 injections of "Stilbestrol Dipropionate" two ounces on alternate days during the month of January, 1957. This additional introduction of "Oestrogen" had a very good effect on the cow, and the quantity of milk began to increase, though it was very thin in consistency. At the same time, her udder was massaged daily with one per cent "Stilbestrol" ointment, and she was given a diet of high nutritional value, consisting of oats, gram, groundnut cake and plenty of green fodder. Her ration was further supplemented with chalk, mineral flour and salt.

NORMAL MILK YIELD

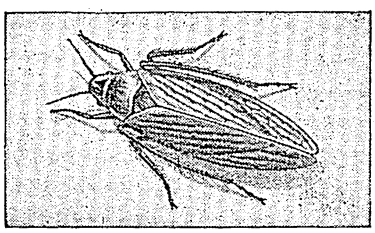
Her milk yield was actually recorded on 1st April, 1957, when it became normal in appearance and consistency, and was found to be 21 pounds. In the whole of April, the total yield obtained was 766 pounds.

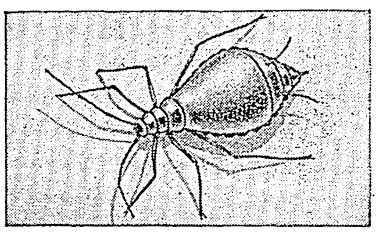
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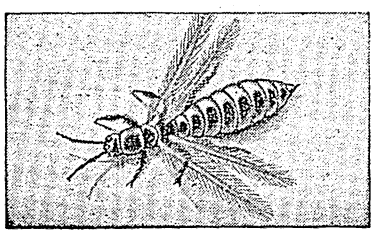




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MALATHION *is available in formulated insecticides through local dealers.*

CYANAMID

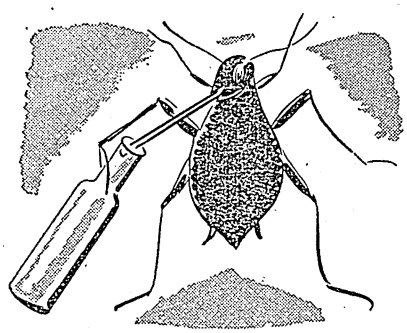
CYANAMID OF GREAT BRITAIN LTD
FARM AND HOME DIVISION
BUSH HOUSE, LONDON, W.C.2

WHAT'S NEW IN FARMING

APHIDS ON MUSTARD

APHIDS often damage the mustard and rapeseed crop by sucking the juice of the plants. The pest appears when pods are being formed. In an epidemic form, the pest covers the whole plant.

In the Gujarat area of Bombay State, spraying the crop with nicotine sulphate has been found to give a good control of the pest. A pound of nicotine sulphate (40 per cent) is dissolved in 40 gallons



of water. Four pounds of soap chips are dissolved separately in half a gallon of water and this solution is poured into the nicotine sulphate solution, and the mixture stirred thoroughly. This quantity is sufficient to spray half an acre of the crop.

The mixture is spread evenly over the crop with a sprayer. To get a good control of the pest, the spray may have to be repeated twice or thrice.

COTTON YIELDS

A cotton crop grown after a fallow was found to give the best yield, followed by cotton after *guara*, berseem or gram, in experiments in the Punjab. Cotton after wheat gave the lowest yield.

The cotton crop in the rotation wheat-fallow-fallow-cotton gave 16.5 maunds of cotton per acre, and in wheat-*guara*-fallow - cotton 16.4 maunds. In wheat-fallow-berseem-cotton the yield of cotton was 15.8 maunds while in wheat-fallow-gram-cotton it was 14.5 maunds.

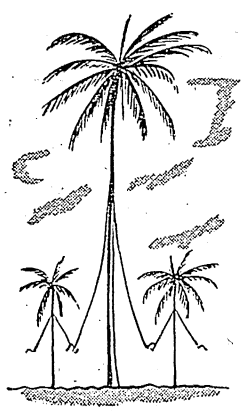
In the wheat-fallow-wheat-cotton rotation, the yield of cotton was 12.7 maunds.

UNDERPLANTING IN COCONUT GARDENS

SOME important points about underplanting in a coconut garden have to be remembered.

Underplanting means planting new seedlings a few years before the uneconomic grown up trees are actually cut; the method is being commonly practised in coconut gardens.

When underplanting, the new seedlings should be planted ten to 12 feet away from the old trees.



Underplanting should not be done when the trees in a garden are only 30 or 40 years old, as they still will have some more economic life. This, of course, does not apply if the trees were surface-planted; such trees have a shorter economic life than deep-planted ones.

All newly-planted seedlings should be properly manured, so that they may get a good start.

A deep digging or ploughing of the soil around the newly-planted seedlings is necessary to remove the matted roots of the old trees.

NEW BOOKS RECEIVED

Britain—An Official Handbook (1958 edition)

Prepared by the Central Office of Information, London ; price 10s. 6d. (postage extra).

Proceedings of the Seventh Meeting of the Standing Advisory Committee on Agricultural Credit

Published by the Agricultural Credit Department, Reserve Bank of India, Bombay.

***Ata* Grading Instructions**

Issued by the Directorate of Marketing and Inspection, Ministry of Food and Agriculture, Government of India, New Delhi.

Gandhi Marg

A quarterly journal of Gandhian thought ; Editor S.K. George ; published by ' Gandhi Samarak Nidhi ', Mani Bhavan, 19-Laburnam Road, Gamdevi, Bombay-7; price per copy Rs. 1.50 (Rs. 5 a year).

Poona Agricultural College Magazine—Golden Jubilee Souvenir

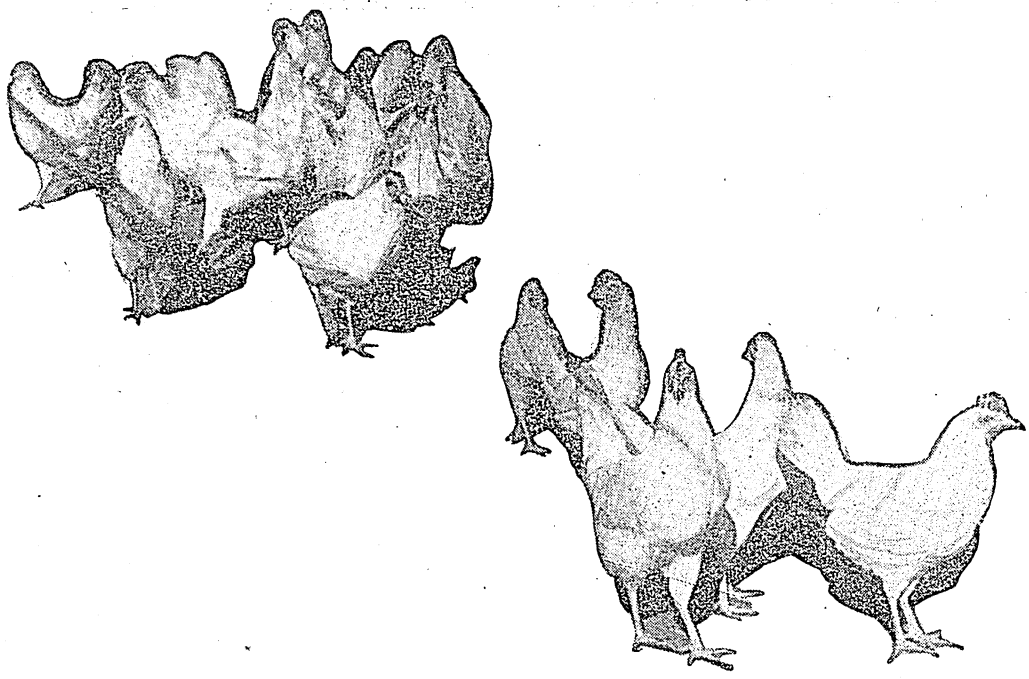
Published by the Agricultural College, Poona ; price Rs. 10 plus Re. one for postage.

The Agricultural Notebook (13th Edition)

By Primrose McConnell; published by Farmer & Stock-breeder Publications Ltd., Dorset House, Stamford Street, London, S.E.1; price 40s. net (Postage 1s. 1d.).

Common Weeds of Cultivated and Grass Lands of Mysore

By K.S. Krishna Sastry ; published by the Department of Agriculture, Mysore State.



POULTRY BIRDS CAN EARN THEIR KEEP AND MORE

by

S. R. Sabnis

Manager, Poultry Development Scheme
Vidyamandir, Narayangaon

WE have been running a poultry farm at Narayangaon in Poona district for five years now. We have achieved some success on this farm, and we think that some of the things we follow would be worthwhile tips for would-be poultry farmers or struggling poultrymen.

Of course, poultry birds do pay. On this point, nobody has any dispute. Your hens will consume things like spoiled grains, insects, white ants, small grass and lime, and many other things that normally have no other use; in return they will lay eggs which sell well these days.

For raising a good crop, you would certainly go for pedigree seed. For raising a good poultry flock also, you must have a good cock of a recognized high-laying breed such as White Leghorn or Rhode Island Red. Dispose of your country cocks. They produce only low-yielding hens. The improved breed cock will enable your hens to produce chicks which will grow up to produce more eggs than their mothers did.

HOW MANY MORE

At the Indian Veterinary Research Institute, Izatnagar, where they conducted careful experiments, country hens when crossed with White Leghorn cocks produced pullets which began producing an average of 116 eggs per hen per annum, and by the sixth generation, they were producing 186 eggs per hen per annum. The average weight of the eggs also increased from 3.75 to five *tolas*.

This means that in about five years the hen-owner would get 70 eggs more per hen per year, just by mating the hens and their progenies with cocks of such breeds as White Leghorn or Rhode Island Red.

Surely, you would say that you need cash for purchasing a cock of the improved breed. Of course, you do. But you can sell away two or three of your country cocks, and with the money realized buy a cock of an improved breed from a reliable source. Thereby you will be doing two things: you will be eliminating the poor country cocks from your flock, and will be obtaining a cock of a good breed without paying any extra cash. But, do this continuously for five generations so that you too can get some 70 eggs more per hen.

FEED PROPERLY

Your cows or buffaloes will not give you any good quantity of milk

unless you feed them properly. The same is true of fowls too. The egg contains a good protein. For growing this protein, the hen needs a sufficient quantity of protein material to eat. You can get this for her cheaply by buying groundnut cake. Soak a little of it in water for a few minutes. To this, add wheat bran or rice polishings, bone powder, oyster shell and a little salt. Feed this mixture to your hens at 11 a.m. every day.

Give mixed grains to your birds twice a day. Greens contain vitamins and minerals essential for birds. See to it that the birds do not lack in green feed. A proper quantity of feed, say, about four ounces or ten *tolas* per bird per day, will help you get more eggs every day.

AVOID THE *DALAL*

When you sell eggs, avoid the *dalal*, or the middleman. You and other poultrymen in your village can easily form a co-operative marketing organization. Then you can make your own arrangements to supply eggs direct to the consumers who will pay you better prices for the better eggs that you sell.

Remember that the best customers for quality eggs are the city folks. They will pay well for fresh eggs. Therefore, you must arrange to send the eggs at least twice a week to the customers. They will not then get spoiled or go stale. Any smart boy in the village can be employed to collect and sell the heavier eggs.

KEEP EGGS FRESH

There is also an easy and cheap way of keeping eggs fresh. Get an earthen vessel (*matka*) of the type we use for storing drinking water. In the floor of your house dig a hole sufficient to bury half the pot. Mix the earth scooped out of the hole with an equal quantity of coarse sand. Place the pot in the hole and bury it up to half its height. Place the earth-sand mixture round the above ground portion of the pot. Keep this earth-sand mixture moist by regularly sprinkling it with water. Wash some fine sand clean, allow it to dry and place a layer of it inside the pot. Keep your eggs carefully on this sand layer, cover the mouth of the pot by securely tying it with a thin clean piece of cloth. This way, eggs keep fresh for more than a week.

CHECK DISEASE

There is yet another thing to do—get all your birds vaccinated against Fowl Pox and Ranikhet disease. The veterinary doctor does this work for you free of charge. If you get this done, your hens will be immunized against these diseases. It is better you get your neighbours also go in for this free treatment. Unless all of you in the village get this done your birds will not be safe from infection from the other birds. Six-week old chicks can be vaccinated for Fowl Pox and ten week old ones for Ranikhet.

Government poultry farms make White Leghorn or Rhode Island Red hatching eggs available at cheap rates. For a rupee or so each, week-old fine chicks of these breeds are also available.

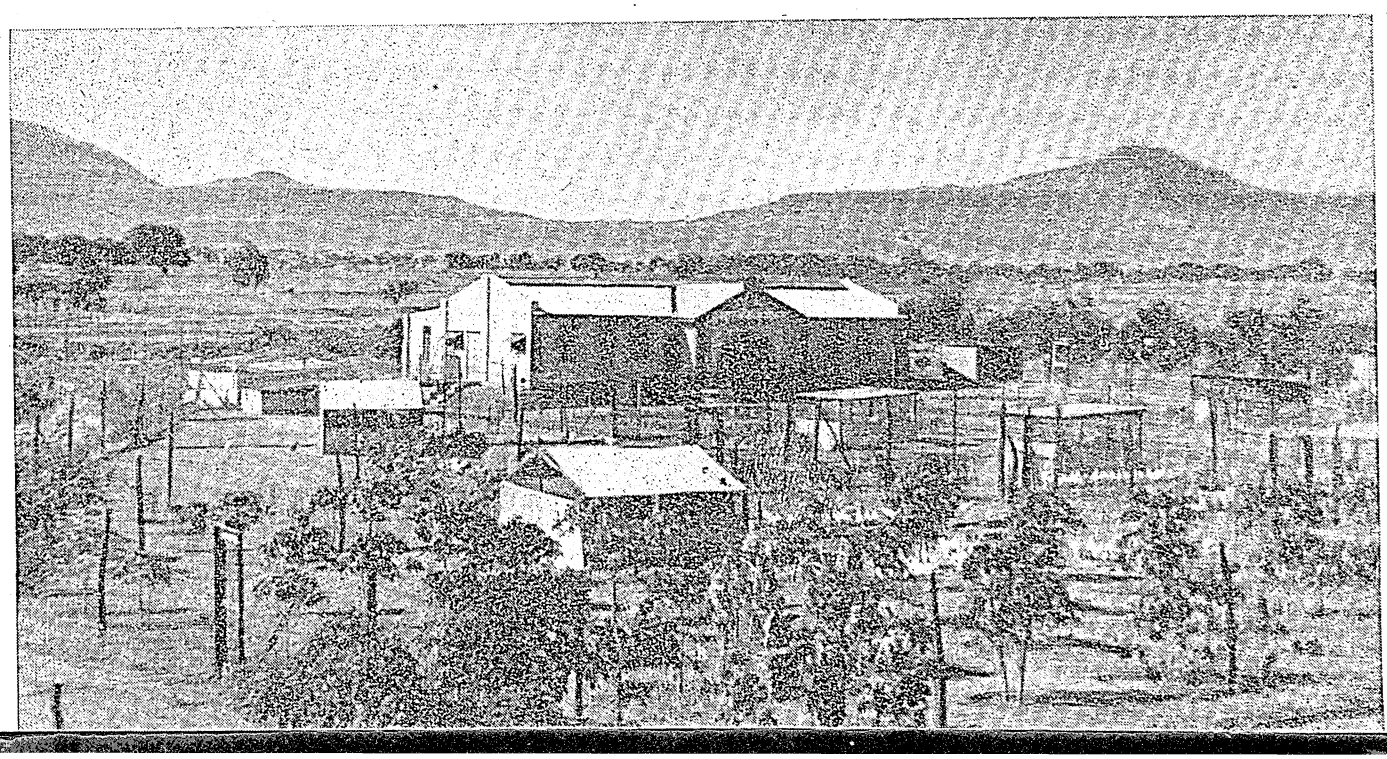
SIMPLE ECONOMICS

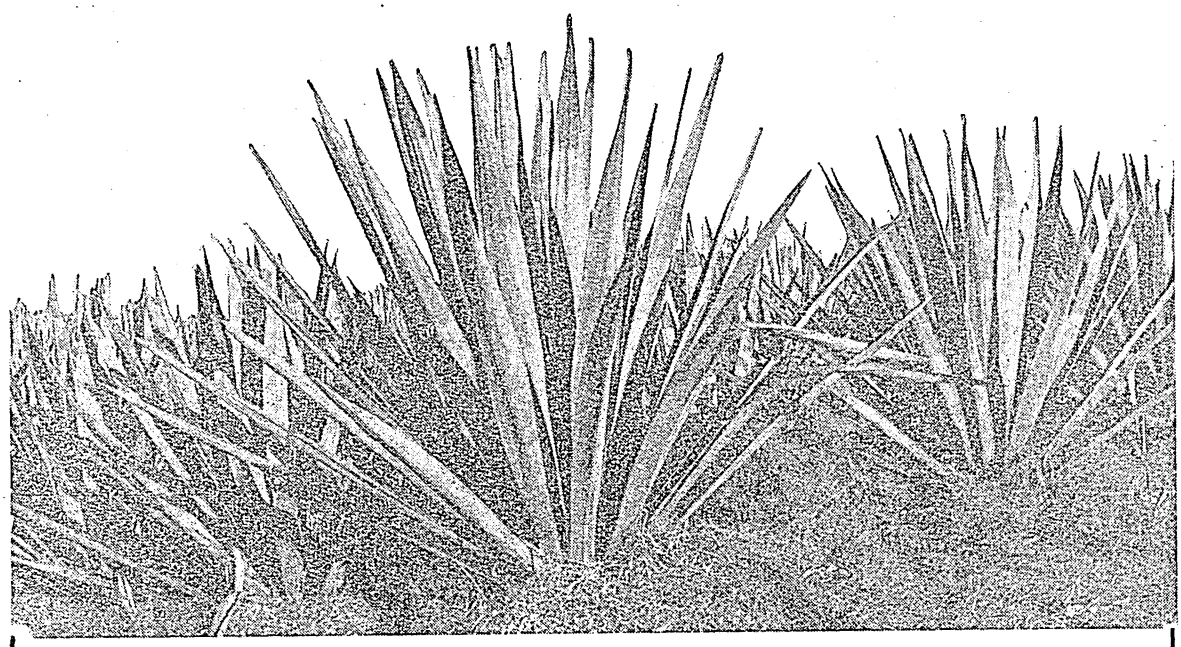
And finally, let's see what profit ou can make from your poultry birds by following these tips.

If you have 25 hens and two cocks you will realize about Rs. 150 a year from the hens. This you calculate on the basis that each hen will lay at least 120 eggs a year. The 120 eggs will fetch you Rs. 15, at two annas per egg. Deducting Rs. nine as maintenance cost per hen, you get a clear profit of Rs. six per hen per year.

Poultry-keeping is an easy job. It can be managed by you or by your womenfolk or by your children, and that too in the spare time available. Try and earn a little more extra money. You need it!

Birds turn highly productive with healthy living conditions, as are provided at the Narayangaon Poultry Farm





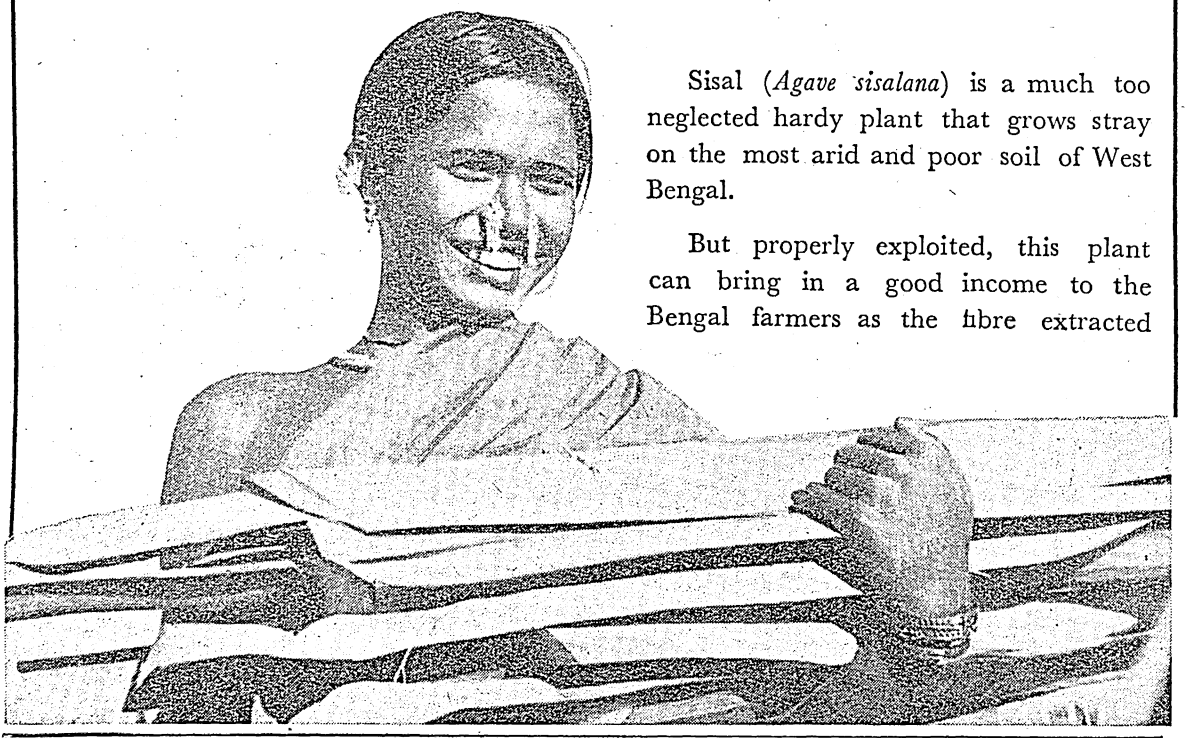
SILVER FROM SISAL

by

T. C. Roy

Publicity Officer

Directorate of Agriculture, West Bengal



Sisal (*Agave sisalana*) is a much too neglected hardy plant that grows stray on the most arid and poor soil of West Bengal.

But properly exploited, this plant can bring in a good income to the Bengal farmers as the fibre extracted

STEP ONE: Fully mature sisal leaves are collected



STEP TWO:

The leaves are cut and stripped on specially designed pedal scrapers for extracting the fibre. If the leaf-supply is large, you can even use an automatic decorticating machine

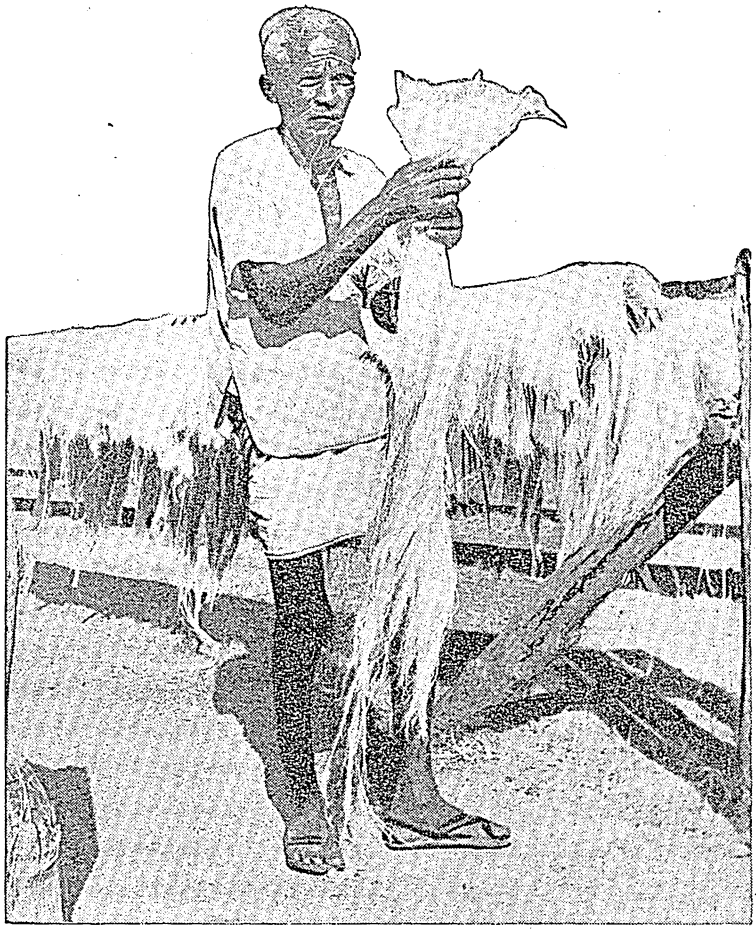
STEP THREE:

Extracted fibre is dipped at the tips in clean water, and then threshed on a stone twice. It is then washed in cemented shallow tanks immediately after, to get rid of the gummy and other unwanted substances. Then it is spread out in the sun in thin layers to dry



from it is much in demand for making marine cordages, binders, twines, fishing nets, hammocks, door-mats, rugs and carpets, coarse canvas and sacks, braids for ladies' hats, electric installation, and yes—paper and paper boards. The shorter fibres go to make ropes and brushes.

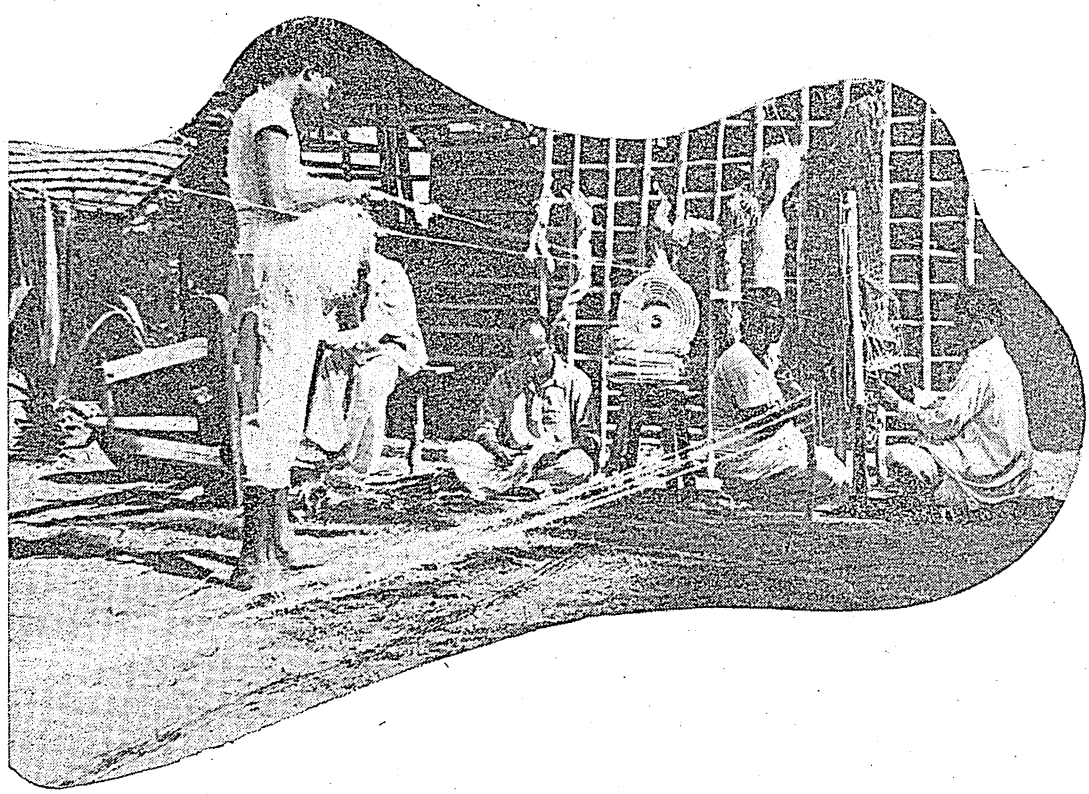
From the pulp residues come such products as industrial alcohol and acids. The fibre itself is a good organic manure. And sisal waste gives out 'cortisone', a valued drug.



- From an acre of sisal you can get 500 to 1,200 pounds of fibre a year
- India produces about 5,000 maunds of sisal fibre a year
- But she imports 13,50,000 maunds of sisal, Manila and such other fibres a year
- The demand for sisal fibre is on the increase
- Sisal fibre production, therefore, offers good scope for development as a cottage or large-scale industry
- A 1,000-acre plantation can keep 150 men busy for 300 days a year for decortication alone! And, a man can earn Rs. 3 a day making ropes
- The Government of West Bengal recently established a 1,000-acre sisal plantation in the arid fallow land of Rajnagar in Birbhum. In three more years it will start production
- More arid areas everywhere in India can be put under sisal with profit

STEP FOUR:

After sun-drying, the fibre is ready for use . . .



STEP FIVE:

. . . . in preparing ropes and twines

The Tree that Yields the Luscious Mango

by

M.D. Chaturvedi

CULTIVATED throughout the Indian subcontinent as a fruit tree, the mango is noted for its vast number of grafted varieties that have been evolved in different parts of the country. We are, however, concerned here with the mango as a tree raised from seed and found growing in groves and camping grounds and along roadsides.

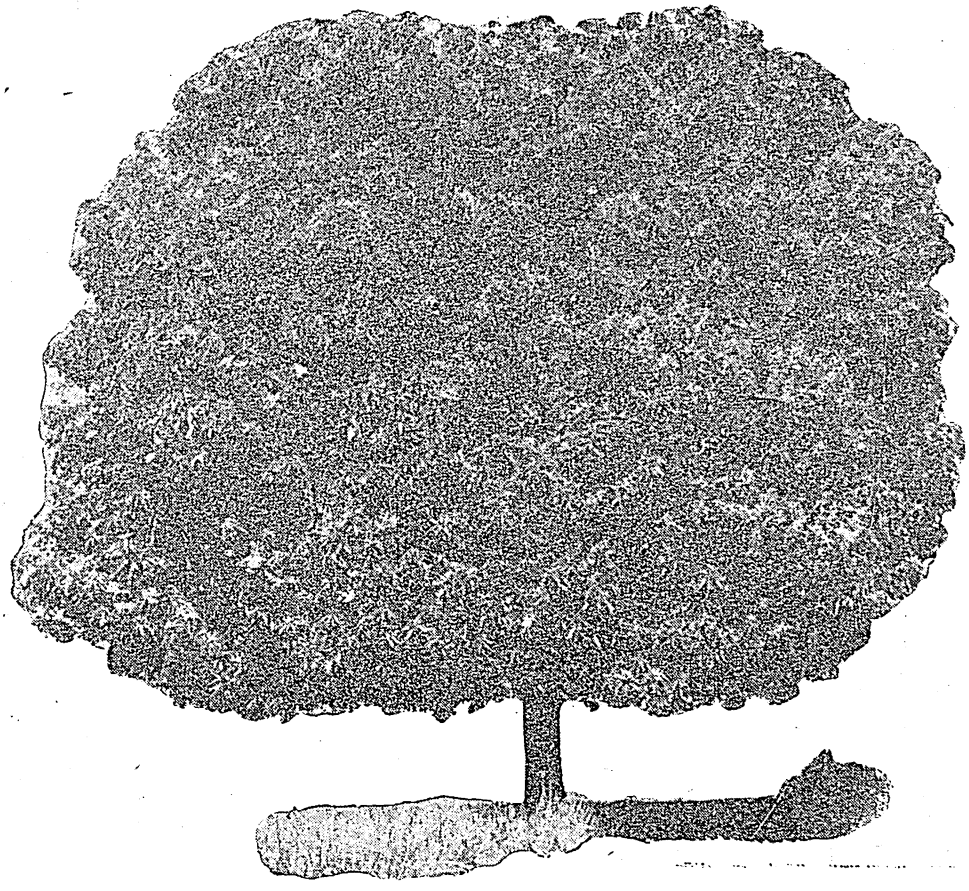
The mango is a large, evergreen tree with a dense, rounded crown and dark green papery leaves with a characteristic scent. The stalks of the leaves are swollen at the base.

The mango is met with all over the country, and more particularly close to human habitations. In the days of old, men who mattered earned merit by planting a large number of mango trees. In the district of Partabgarh, Uttar Pradesh, the writer came up against a grove of what must have originally consisted of a hundred thousand trees—appropriately called *lakhi bagh*—planted by the local raja. The mango is seldom met gregariously in the forest, except on or near sites of old abandoned villages and monasteries.

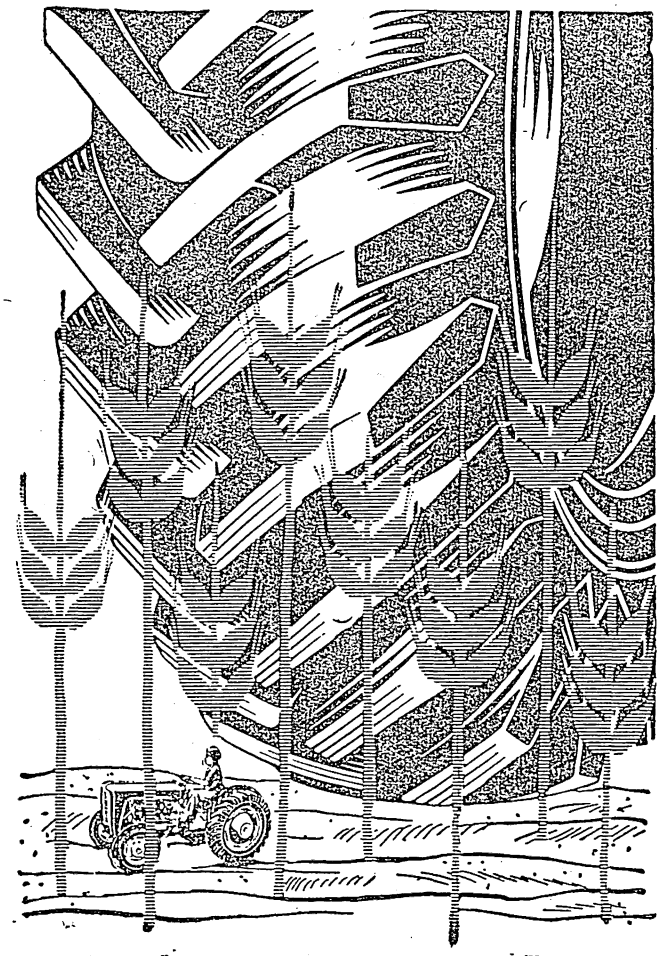
WIDELY DISTRIBUTED

The mango has a fairly wide distribution, and occurs freely in Assam, the Gangetic basin, the sub-Himalayan tracts, Chota Nagpur, Satpuras and the Western Ghats. It affects shady and moist places, avoiding dry and sandy tracts of north-western India where it has been assiduously cultivated.

Due to its wide occurrence, the mango is known by a variety of names: *aam*, Hindi; *amba*, Marathi; *maa*, Tamil; *mavu*, Kanarese; *mamidi*, Telugu. Its scientific name in Latin is *Mangifera indica* (fero: I bear).



This mango tree growing in Barabanki has an individuality of its own



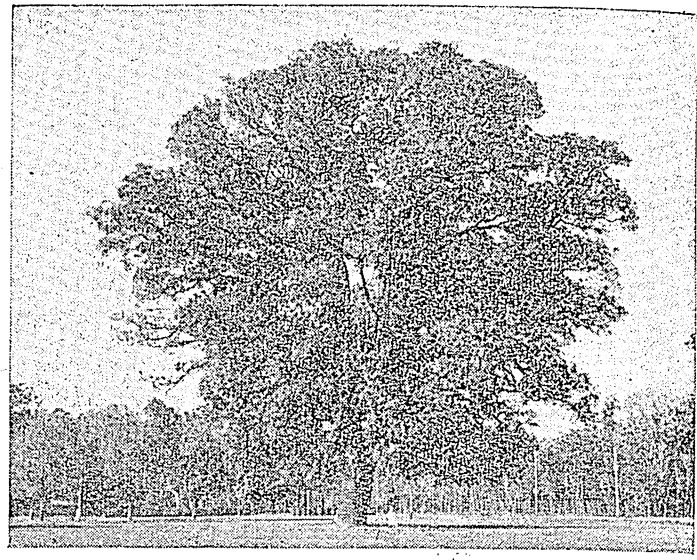
This tyre lowers your farming costs

Tractor farming becomes easier with the Dunlop RT 33 open centre tractor tyre which has more tread bars to give the maximum grip on hard dry soils. This tyre reduces power loss on the tractor and enables a greater acreage to be ploughed per day.

More tractors in India are fitted with the Dunlop RT 33 Tyre than any other make

DUNLOP

DTC-15



A large mango tree at the Forest Research Institute, Dehra Dun

PROPAGATION

The mango is easy to grow from seed. Grafting of mangoes is quite an art, known as 'inarching.' A branch of a good fruit-yielding variety is grafted on a young seedling. When the two cut surfaces get united, the branch is cut off and the top of the seedling also is cut. The seedling nurses the branch grafted on it. Grafted trees are usually small in size. Their number is legion, the chief among grafted varieties being: *Malda* (Bihar); *Langra* (Banaras); *Dasheri*, *Safeda* and *Samar Bahisht* (Oudh); *Kalmi* (Saharanpur); *Alphonso* (Bombay); *Malgova* and *Banganpalli* (South). Cultivated mangoes exhibit great variety in size, shape and flavour.

Small, yellowish green flowers with a strong heavy scent appear in terminal panicles about a foot long. In the Deccan, they are in evidence from January to March and fruits ripen during May-June. In north India, the flowering and fruiting take place two to three months later. The wild fruit is smaller than that of cultivated varieties, and is generally more juicy than fleshy. The mango yields a profuse crop of fruits about once in three years.

FAST GROWTH

Young seedlings develop fairly fast in the early stages especially when kept weeded and watered. The growth ceases during winter and begins again in spring. The seedlings require protection against frost; can stand a fair amount of shade. Carpets of seedlings are often found under mother trees during the later half of monsoons, and can be easily transplanted.

The mango does best in well-drained moist loams. It does not prosper in dry tracts, nor does it favour swampy conditions. The mango cannot stand drought for long.

The mango is prized for its fruit and shade. The tree is seldom cut until it ceases bearing fruit. The timber is not durable, and is used for packing-cases, planking and a variety of other purposes.

fertilizers boost forage yields

by

H. C. Malik

Assistant Economic Botanist (Fodder)

Sirsa, District Hissar, Punjab

RESULTS of some of the projects in pasture improvement undertaken in the Kangra Valley of the Punjab are now available. Of these, the results of the study of the response of grasses to fertilizers are of interest to all farmers wanting to improve their pastures.

Natural pastures are important for raising livestock, especially in the hills where the rearing of cattle and sheep is the main industry. But the pastures have deteriorated to such an extent due to overgrazing and overstocking that they produce very little. Where an acre was sufficient for maintaining two animals at one time, it is now difficult to maintain even one animal on ten acres of pasture land.

Experiments in the improvement of pastures have been undertaken at the Hill Grasses Research Station, Palampur, in the Kangra Valley. Work here includes research on improvement of grasses by breeding, and of grasslands through different methods of management.

AN EXPERIMENT

At the Station, *sarwala* or *lamb* (*Heteropogon contortus*) was selected for the experiment out of the large number of forage grasses found in the hills. It is a very common grass growing at elevations of up to 4,000 feet. It is able to grow on a wide variety of soils, permitting of several grazings during the rains. It is also a nutritious grass for cattle.

Sarwala produces plenty of seed, sprouts quickly and is relished by cattle, before it flowers. After the grass is mature, however, cattle avoid it. Palampur receives a rainfall of 110 inches of which 75 inches are received during the monsoon months of July, August and September. This high rainfall greatly influences the sprouting ability, growth and yield of pasture grasses. However, in winter, as the cold is severe and there is no moisture in the soil, the grasses dry up completely and remain dormant till the rains are received again.

SPECIAL MIXTURES

Since non-legumes generally give good results with fertilizers, especially the nutritious ones, single and special growth mixtures were used on *sarwala* in the experiments. The various fertilizers used were superphosphate at 220 pounds, ammonium sulphate at 100 pounds, a growth mixture (17 pounds nitrogen and three pounds phosphoric acid) at 160 pounds, a general fertilizer (15 pounds nitrogen for a pound of phosphoric acid) at 160 pounds, an irrigated sugarcane mixture (12 pounds nitrogen and six pounds phosphoric acid) at 160 pounds, and farmyard manure at a 100 maunds per acre.

The plots given farmyard manure received the manure a month prior to sowing or the sprouting of the grass. The other fertilizers were applied after the first shower of rain when the grass had germinated. The growth and stand of the grass were satisfactory. It was cut during the growing season, after which it dried up.

HIGH YIELDS

The grass in the different plots for the three years of the experiments gave the following average yields.

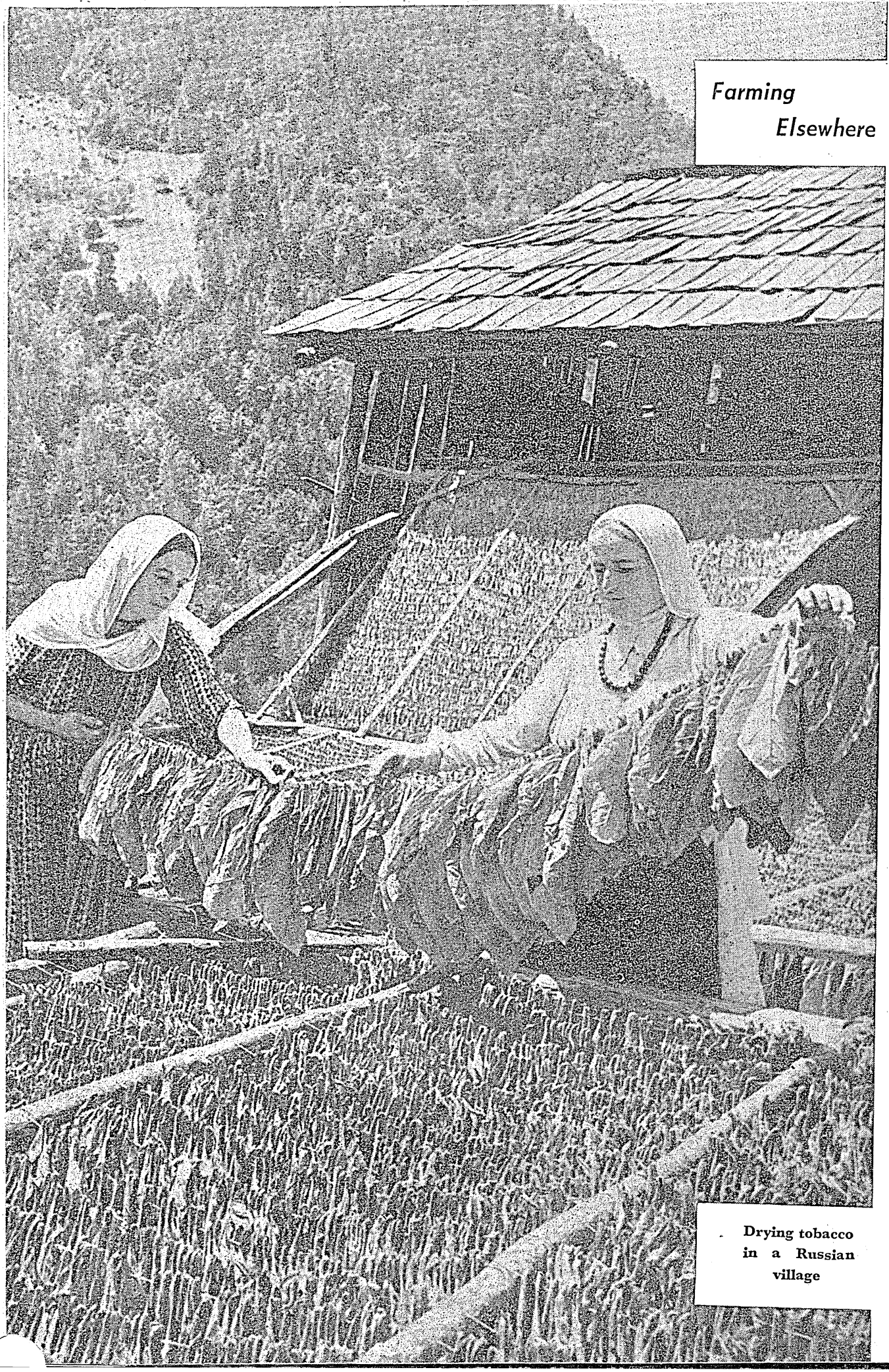
Treatment	*Yield of grass in maunds per acre*
No manure	96.7
Superphosphate	138.7
Ammonium sulphate	122.2
Growth mixture	185.1
General fertilizer	191.5
Irrigated fertilizers	135.0
Farmyard manure	136.6

THE BEST TREATMENT

Of these six fertilizer treatments, the growth mixture (17 nitrogen : three phosphoric acid) and general mixture (15 nitrogen : five phosphoric acid) gave the best results, showing how nitrogen and phosphoric acid could increase the yield of grass and also how inorganic nitrogen was effective in the presence of phosphate.

The experiments have shown that one sure method of increasing the yield of forage in the grasslands of the high rainfall areas of the Kangra Valley is to apply nitrogenous and phosphatic fertilizers in combination. With such a fertilizer programme, forage yields go up by over 90 per cent.

Farming Elsewhere



Drying tobacco in a Russian village

In the U.S.S.R.,

Two Crops of Tobacco a Year

by
I. Mikeladze

TOBACCO, corn, grapes, fruits, potatoes, vegetables and melons are cultivated in the alpine districts of Ajaria. But the staple crop is tobacco. Fifty-five to sixty per cent of the farms' total returns come from the sale of this crop.

Many tobacco-growing farms gather as much as two to 2.5 tons of high quality tobacco per hectare (one hectare=2½ acres). One of them is the "Pravda" Collective Farm of Tbeti Village, Shuakhe district.

The fields of the Collective Farm lie at more than a 1,000 meters above sea level, where the vegetative period lasts not more than 180 to 190 days.

Advanced agrotechnical methods of growing tobacco enabled the "Pravda" Collective Farm to harvest in 1956, despite unfavourable climatic conditions (drought in summer and early frosts in autumn), 2.3 tons of *Trapesund No. 1867* tobacco. In 1957, the yields increased to 2.5 tons per hectare.

EARLY SEEDLINGS

According to the tobacco growers of this Collective Farm, the major factor ensuring high yields is the production of early and healthy seedlings in quantities which more than meet the requirements of the plantation. Already in autumn, preparations are begun for growing early seedlings. Dung is brought under glass, the soil is loosened and partly renewed ; a nutritive mixture consisting of soil, decomposed dung and sand is prepared, and the frames are repaired and disinfected.

By the end of January, hotbeds are prepared for sowing and seeds are sown from February 15 to February 20. In March, seeds are sown in open beds. The area sown to seedlings under glass and in the open amounts to a 100 square meters per hectare of tobacco plantation. This not only ensures a sufficient supply of seedlings for laying a plantation, but also for replacing plants that failed to take root.

Ten to 15 days before planting, the tobacco plantations are ploughed twice and harrowed. Decomposed dung is spread at the rate of 20 tons and superphosphate at the rate of 400 kilograms per hectare.

Planting is done at the rate of 73,000 to 75,000 seedlings per hectare, and this number of plants is preserved up till harvesting time. The soil is hoed three or four times during the season ; the hoeing is preceded by the introduction of nitrogenous fertilizers at the rate of 200 kilograms per hectare. In order to increase the growth of leaves, plants are topdressed once or twice with organic manures at the rate of 0.5 liter per plant.

TIMELY PRUNING

The collective farmers of Ajaria consider timely pruning of side-shoots, which take away a large amount of nutritive substances from the productive parts of the plant, an important means of increasing crop-yields and improving the quality of tobacco. The pruning is usually performed twice during the season.

By harvesting time, barns are prepared for curing tobacco, and new ones built, if necessary, so as to provide two to three barns and 50 to 75 three-meter cars per hectare of tobacco plantation.

Harvesting is usually begun when the lower layer of tobacco leaves is ripe, that is, by the end of June and the beginning of July in the locality.

TWO CROPS

Of late, the Collective Farm expert growers began to obtain two harvests of tobacco a year. At first, this was done as an experiment by individual farmers on small plots. Their experiment was successful. This year, the Collective Farm tobacco growers obtained two harvests from the entire area of the Farm's plantations. The second time they got 0.6 to 0.7 ton of high-grade tobacco per hectare.

This is how a second crop is obtained. Early planting of seedlings in spring and good care make it possible to finish picking leaves of the first crop by the middle of September. On each plant, one or two of the better developed shoots are left, while the rest are removed. The racemes and new branches that appear on these shoots are also torn

(*Contd. on page 40*)

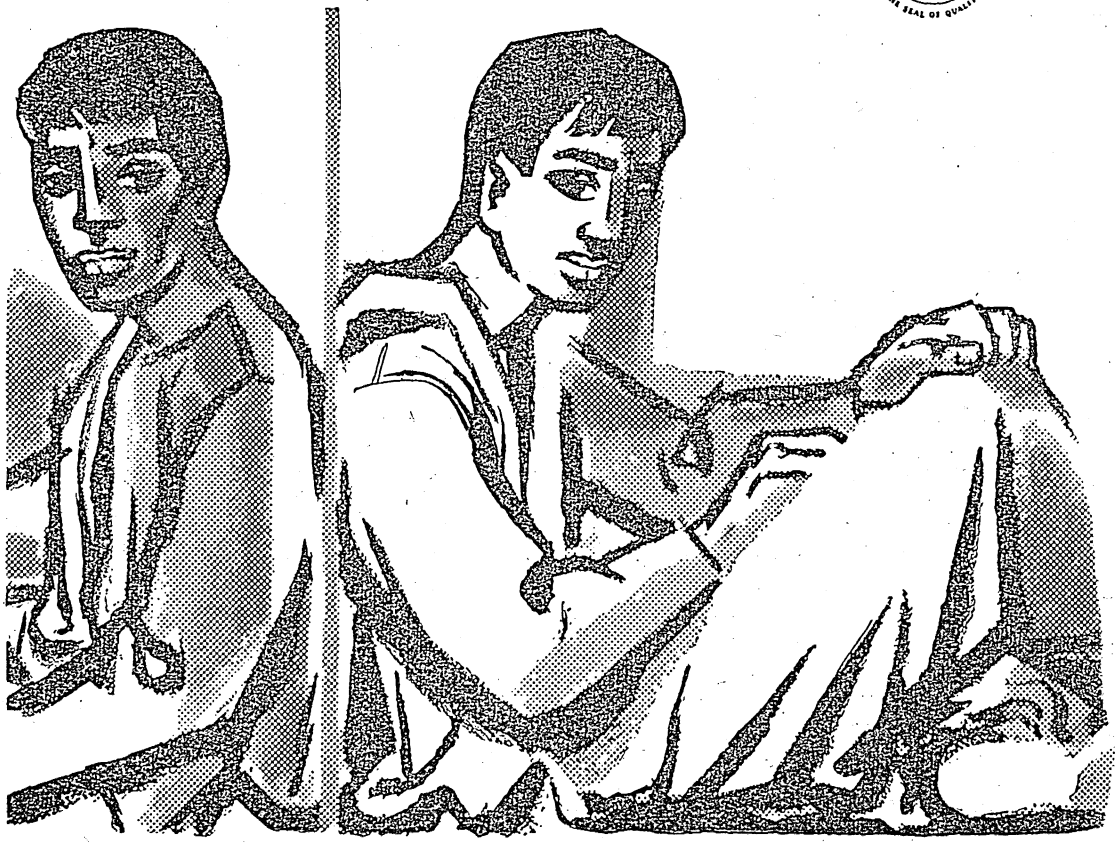
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A Better Way of Tackling Weeds in Sugarcane

by

R.D. Verma and R.B.L. Bhardwaj

Indian Agricultural Research Institute, New Delhi

A SUCCESSFUL approach to the weed problem in sugarcane has been developed at the Indian Agricultural Research Institute, New Delhi. It consists in combining the cultural and chemical practices of weed control.

Weeds compete with crops and cause serious damage to them. Of course, the extent of such damage largely depends on the relative times of germination and the initial rates of growth of the crop and the weeds. In some cases, as in berseem, the crop germinates before the weeds come out. Hence, there is very little chance for the weeds to seriously compete with the crop. In other cases, as in maize, the growth of the crop is so fast that the crop plants get the upper hand over the weeds. But there are still other crops which are very slow to germinate and appear much after the weeds have established themselves; sugarcane is one of them.

In sugarcane, because the setts germinate slowly and a larger spacing is given between the rows, the weeds grow unchecked and seriously compete with the young sugarcane crop for food, moisture, light and space. In sugarcane fields, a large variety of weeds thrive, particularly in the early stages of the crop. Most common among the annual weeds are the *untchara* (*Heliotropium* sp.), *jungli* jute (*Corchorus* sp.), *jungli* rice (*Echinochloa colonum*), *kahundra* (*Digera arvensis*), *itschit* (*Trianthema monogyna*), *nuni* (*Portulaca oleraceae*), *gokhru* (*Aathium strumarium*), *suffed murgha* (*Celosia argentia*) and *hazardana* (*Phyllanthus niruri*).

PERENNIAL WEEDS

Among the perennial weeds, *motha* (*Cyperus rotundus*) and *dub* (*Cynodon dactylon*) are the most common and persistent ones.

While the annual weeds can be controlled, at least partially, by cultural methods, the perennial weeds cannot be controlled by these methods, because in addition to sexual reproduction they also multiply by their underground parts which are difficult to uproot by the ordinary implements used for cultivation.

Normally, sugarcane receives intercultivation. But this operation has some drawbacks so far as weed destruction is concerned. Firstly, besides being costly and laborious, hoeing is only partially successful in eliminating weeds. The weed plants that escape destruction are those near the crop plants. These set seed and reinfest the field in the following years.

Secondly, in hoeing, the germinated and the germinating weed seedlings may be destroyed but those weed seeds that are buried deep and are dormant are brought up to the surface where they quickly germinate and produce a new weed crop.

Thirdly, the perennial weeds are not very much affected by hoeing, and at the most suffer a temporary set-back. Weeds like *motha* and *dub* will fully re-establish themselves just a few days after hoeing. In fact, under certain circumstances, hoeing may indirectly help the spread of these weeds. This is so because the underground propagative parts of the weeds get broken up into smaller bits and are carried to the other parts of the field where they soon establish themselves as new plants.

Lastly, it may not always be possible to undertake cultural operations at the right time due to unfavourable weather conditions. Many a time, because of heavy rains, the fields remain so wet that even if the stage is ripe for intercultivation it may not be practicable. Under such circumstances, you can only watch helplessly the weeds robbing the soil of the precious nutrients which rightfully belong to the crop.

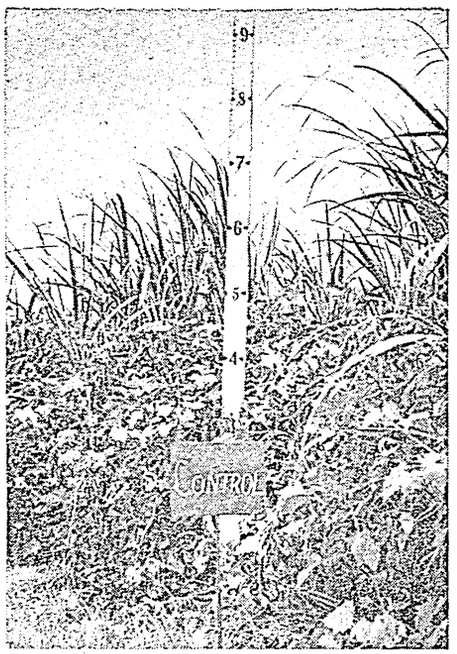
CONTROL WITH CHEMICALS

In recent times, chemical control of weeds has opened a new era in sugarcane cultivation. Though a large number of weedicides have been tried none so far has proved as effective as the phenoxy compounds, two most important of them being 2, 4-D (2, 4-Dichlorophenoxyacetic acid) and M.C.P.A. (2-Methyl 4-chlorophenoxyacetic acid). However, even with these, control of weeds is only partial. The compounds are very toxic to most of the broad-leaved weeds and *motha*, but in the doses in which they can safely be used in standing crops they have very little effect on grasses.

Hence, though the crop can be kept free of broad-leaved weeds and some annual grasses by applying these weedicides, the perennial grasses are found encouraged to grow.

That is why a combination of cultural and chemical practices for weed control was thought of at the Institute.

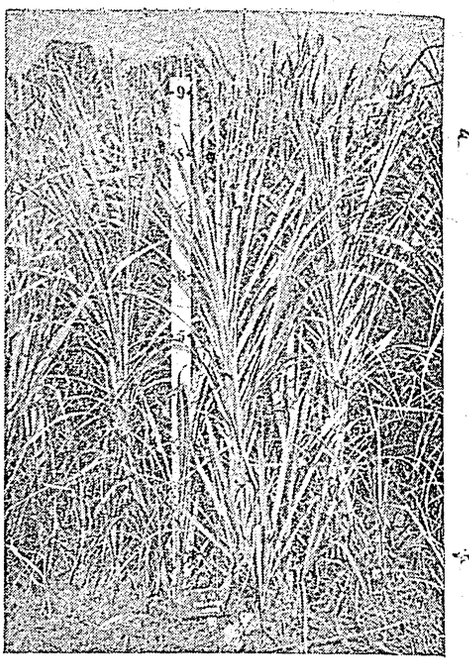
Sugarcane takes 15 to 20 days to emerge. A large number of weed seeds germinate during this period. These



Weeds...
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WHEN CULTURAL AND CHEMICAL METHODS ARE COMBINED

have to be destroyed before they take up much of the nutrients from the soil and begin to compete seriously with the young plants. This can be easily and successfully done by giving the field a pre-emergence spray of 2, 4-D about ten days after the crop has been planted. The most suitable dose is found to be two pounds (acid equivalent) of the chemical in 60 gallons of water.

ACID EQUIVALENT

The acid equivalent is always stated by the manufacturers of proprietary products. How much of the chemical has to be used to supply the recommended rate of application expressed in terms of acid equivalent, is calculated from the following formula.

Multiply the rate (acid equivalent desired to be used) by 100, and divide it by the percentage of acid in the given product (as stated by the makers of the product). For example, if the product contains 80 per cent acid, the actual quantity of the product to be used to obtain two pounds acid equivalent per acre in application would be $\frac{2 \times 100}{80} = 2.5$ pounds per acre.

The solution of the chemical is prepared this way. First, just enough water is added to the requisite quantity of the chemical to make it into a smooth paste. About 60 gallons of water are then added to this paste in a bucket and the contents mixed thoroughly. The solution is then applied to the field in a suitable sprayer, keeping the spray as fine as possible.

At the Institute, the effect of the pre-emergence spray of 2, 4-D at two pounds per acre on the weeds in the sugarcane field is shown below (average per 80 square feet).

	Broad-leaved annuals		*Motha*		*Annual grasses*	
	Number of weeds	*Percentage reduction over control*	*Number of weeds*	*Percentage reduction over control*	*Number of weeds*	*Percentage reduction over control*
Control	35.8	—	769.0	—	358.0	—
Treated	7.0	80.5	475.0	38.5	97.0	70.1

Results show that the weed population is reduced markedly when the spray treatment is given.

The remaining weeds, mainly annual and perennial grasses, can now be destroyed by giving two to three hoeings with the cultivator implement at itervals of about three weeks, or after each irrigation, the first hoeing being given when the crop is about six weeks old. This will keep your crop fairly free of weeds.

The crop should be earthed with the first shower of rain. This is important, as it not only provides an extra support to the growing plants, thus preventing lodging at later stages, but is also equally important

for weed control. By earthing, those weeds which have escaped destruction by hoeings get buried under the soil and are thus eliminated.

Within a month of the earthing, whenever conditions permit, another spray of 2, 4-D at the same rate should be given. This spraying will destroy all weeds which have come up after the earthing, and will also prevent regrowth of *motha* greatly.

COMPLETE ELIMINATION

These combined operations will result in a complete elimination of most of the weeds mentioned, and leave the field clean for the rest of the life of the crop.

How the method of combining the chemical and cultural practices for controlling weeds is beneficial to the sugarcane crop, as seen in the increased yield, is given below.

Treatment	*Yield per acre (in maunds)*	*Percentage increase over control*	*Net profit over control** Rs. a. p.
1. Control	718.3		
2. 2, 4-D alone at four pounds per acre (two pounds as pre-emergence and two pounds as post-emergence)	947.2	31.9	309 11 8
3. Hoeings alone	1,048.9	46.0	453 13 10
4. 2, 4-D as in treatment 2+ hoeings	1,180.5	64.3	623 11 7

*1. Price of stripped cane at Rs. 1-7 per maund
2. Sodium salt of 2, 4-D (80 per cent acid equivalent) at Rs. 3-1 per pound
3. Each hoeing at Rs. 7-2 per acre (Rs. 5-2 for one ploughman and a pair of bullocks plus Rs. two for an extra man for holding the cultivator)
4. Cost of spraying 2, 4-D (labour charges only) at Rs. four per acre (two men at Rs. two each)

Thus, it is seen that the increase in yield due to the treatment largely depends upon the degree of weed elimination. The cultural or chemical treatment when taken up singly can control weeds but only partially. Hence, the increase in yield over the control by these treatments is 46 per cent and 31.9 per cent, respectively. When these treatments are combined, a more effective control of the weeds is effected and the yield of stripped cane goes up by as much as 64.3 per cent.

Chemical control of weeds, therefore, is a cheap and effective supplement to the traditional methods of control by cultural means. The two methods combined lead not only to a saving in effort and expense, but also result in a better crop and higher profit. It is in your interest to take to the use of chemical weedicides; but, use these chemicals under expert advice as, when using them certain precautions have to be taken.

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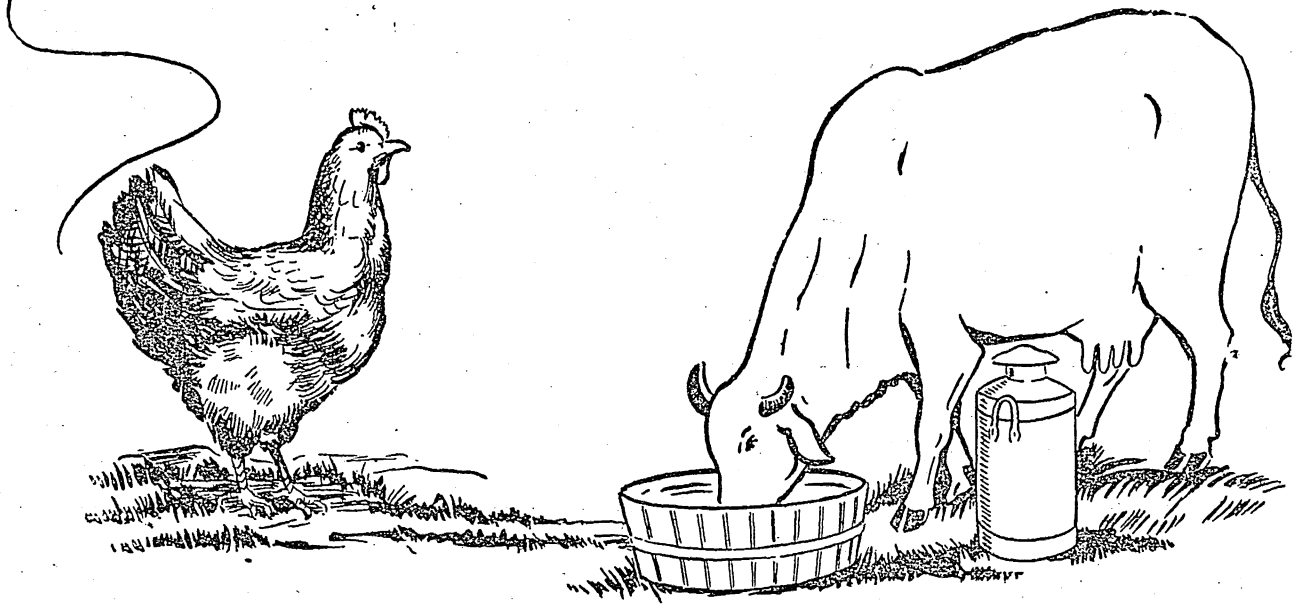
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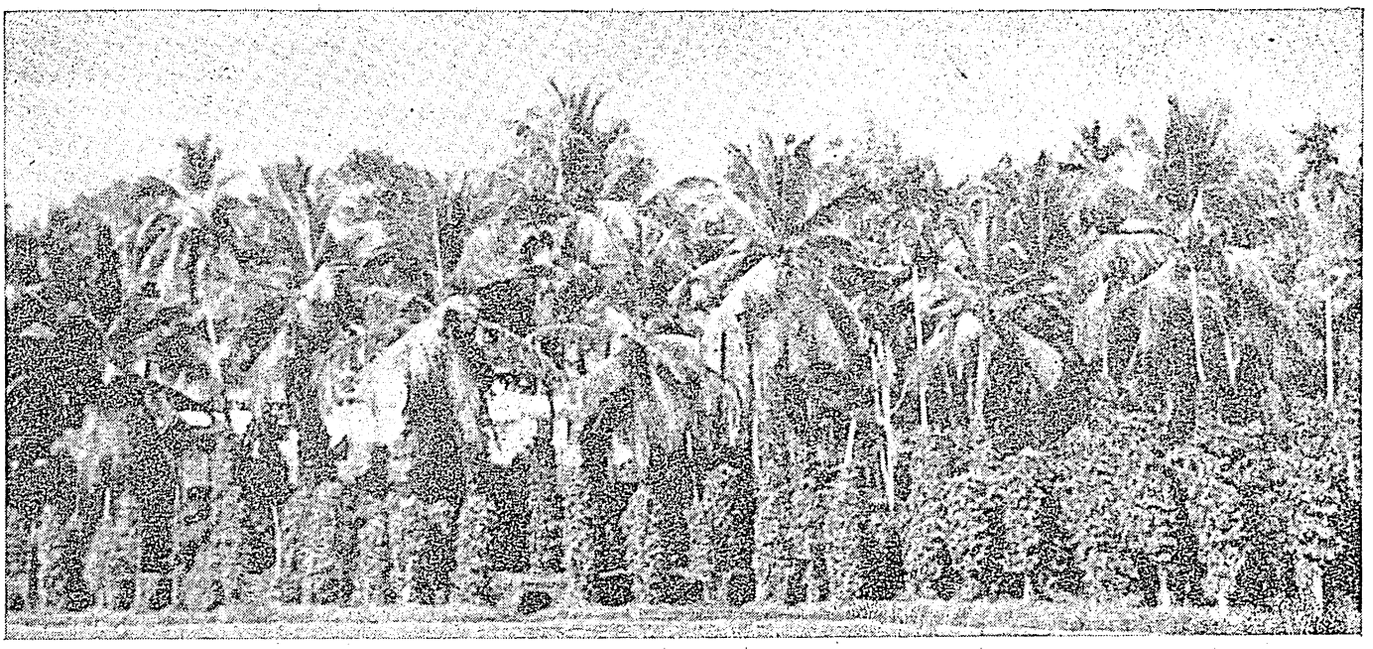
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Pepper vines grown in a household garden. The vines have been trained on coconut trees and deadwood posts

Small Holders Should Come to the Rescue of Spices

by

P. Abraham

RECENT surveys and studies clearly indicate that the production of spices in India can be established on a stable economic basis by encouraging their cultivation as a small holder's crop, mainly in household gardens.

Spices such as pepper, cardamom and ginger are among the outstanding foreign exchange-earning crops of India at present. Clove, nutmeg and cinnamon—the important tree spices of the world—although very widely used in India, still remain articles of import. It is an urgent need, therefore, that the production of all these spices should be stepped up— of the first three mainly for maintaining and expanding the export trade and of the latter three minor spices for making their import unnecessary and, on the other hand, for establishing, if possible, their export trade.

During the last quarter century, pepper, ginger and, occasionally, even cardamom in India experienced very wide price fluctuations, often hitting the country very badly, bringing about serious slumps in their production and trade.

Pepper and ginger, which had artificial 'spurts' during the World Wars, cannot be expected to have the same 'scarcity value' in the future also in view of the serious competition in the world market for these commodities.

Hence, it is important for India to establish her production of spices on a sound economic and scientific basis, so that she may successfully compete with the other spices-producing countries in these very valuable dollar-earning commodities. The best way of doing this seems to be by bringing down their cost of production as much as possible by producing them mainly in household gardens and small holdings in the regions where these crops can be grown.

PEPPER

In south-west India, comprising Kerala State and the Kanara district of Mysore State, which is its original home, the pepper vine has been under cultivation since very ancient times, perhaps a couple of thousand years, or more, before Christ. Pepper is one of the few cash crops of the region. In this region, almost every house compound contains some pepper vines, the number in each compound varying widely. These

vines are mostly trained on the mango, jack, *Erythrina indica*, arecanut or coconut palm or, any other rough barked tree which serves as a good support or 'standard.' Nearly every household is self-sufficient in pepper. The surplus after meeting the domestic needs is sold. It is the produce of the vines of these innumerable small compounds that contributes the lion's share, nearly 90 per cent, of the pepper produced in India today.

It was only in 1928 that the temporary rise in the price of pepper to about Rs. 700 per candy encouraged pepper growers to start new plantings on a plantation scale in North Malabar and South Kanara. The great demand for black pepper in the world market and the consequent phenomenal increase in pepper prices during the last decade, immediately after the Second World War, again encouraged pepper cultivation to some extent, and new homestead pepper gardens and some large-scale plantations sprang up in this region. Indian production of pepper has not even then kept pace with the increase in the world demand for the produce during the post-War period.

The price of black pepper in the world market has been, however, on the decline during the past three or four years. The price per candy, which rose to Rs. 4,500 from the pre-war price of about Rs. 200, has again come down to the present average price of about Rs. 550.

Indonesia and Malaya have brought back their pepper production to the pre-war level, and a very high quality pepper is reported to be now exported by Brazil to the United States of America at a premium.

In the European markets, it is reported that there is greater preference for Sarawak (Indonesian) pepper which being of a much lower quality than Indian pepper, goes much cheaper.

America is now trying to produce pepper in Puerto Rico.

If, on account of all this competition, the price of pepper in the world market goes down still further, there is every possibility of pepper production in India, especially on a plantation scale, coming to a standstill, and even seriously declining, depriving our country of a very important source of foreign exchange from an indigenous product.



Clove trees growing among coconut and arecanut trees

A DELICATE CROP

Pepper is a delicate crop which requires constant attention and care. The initial cost of laying out a pepper plantation itself is heavy. Whether a good crop and price are realized or not, one cannot afford to neglect one's plantation. A permanent labour force has to be maintained. With the slump in the price of pepper during the years 1931-41, a large proportion of pepper plantations on the West Coast became derelict and were abandoned on account of the prices going far below the expenses incurred.

The best organized and most extensive pepper plantations of India are in North Kerala. The most

prominent and enlightened pepper planters of this region, who have spent their lifetime on pepper production and have reaped good profits during the post-war boom period, are now of the view that unless the price of a candy of pepper remains at a high level, i.e., anything between Rs. 1,500 and Rs. 2,000 it would be impracticable and unprofitable to maintain large-scale plantations in the region. They hold that at present, to be really an economic success no one should have more than about ten acres of the pepper crop.

According to Blacklock (1954), the average size of a pepper garden in Sarawak is about half an acre, this being the most convenient area for a family in that country to handle without outside help. Hedda Morison writes that in Sarawak "peper is generally cultivated as a small holder's crop. A great deal of hard work and unremitting attention is called for. Generally, the whole family helps to care for the pepper and an average garden totals about 500 vines." In Indo-China and Malaya also, the situation remains the same.

These facts point to the fundamental conclusion that pepper production, which all along has been a household garden crop in India, should remain largely as a cottage industry.

In homestead gardens in India, very little is spent on the maintenance of pepper vines. The diggings and manurings given to the trees and other crops in such gardens benefit the pepper vines also; the small amount of labour and attention bestowed on the pepper vines is chiefly by the members of the household. Under such circumstances, whatever returns are obtained from the pepper vines are a gain for the owner.

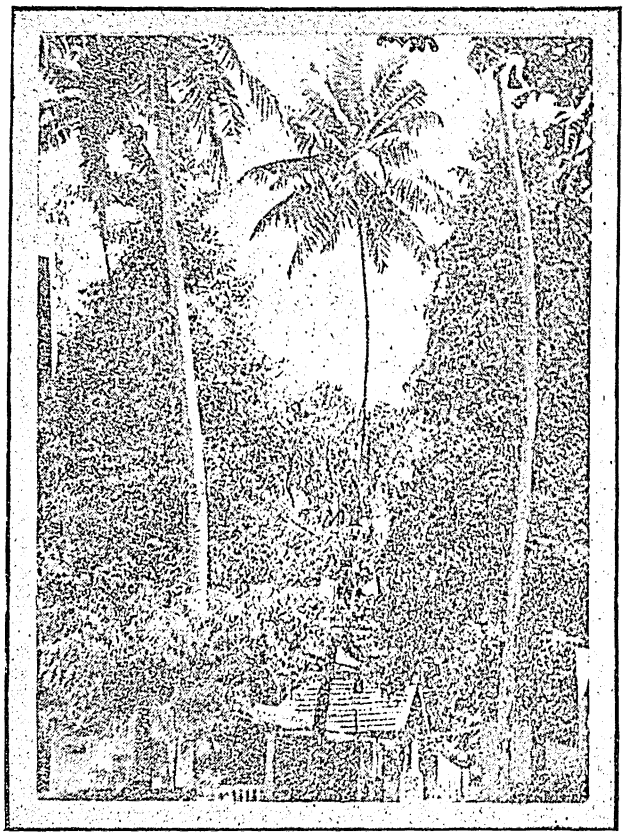
What is required to be done now is to help increase the population of pepper vines in the country by scientifically planting selected superior vines to all the suitable trees in household gardens and small holdings in the areas suitable for pepper cultivation. The vines that die periodically, and old and unthrifty vines in such gardens should also be replaced with selected superior vines.

IN PLANTATIONS

Pepper can also be grown as a subsidiary crop in plantations of tea and coffee by using the shade trees as supports for the vines, and in arecanut and coconut plantations as a mixture as well as by using the palms themselves as supports. In such plantations also, there would not be much expenditure on the pepper vines.

By this method, India will be able to attain in the prescribed time her target of production of high quality pepper on a sound economic basis.

Production of pepper in household gardens and small holdings would reduce pepper plantations to smaller, and very cheaply and efficiently managed, holdings almost eliminating the risks of low prices. On such small holdings, mixed planting of pepper with coconut, arecanut, banana, fruit trees, etc., could be taken up with the greatest advantage to the growers. It was on this basis that pepper cultivation in India survived the past centuries.



Nutmeg trees growing in a household garden

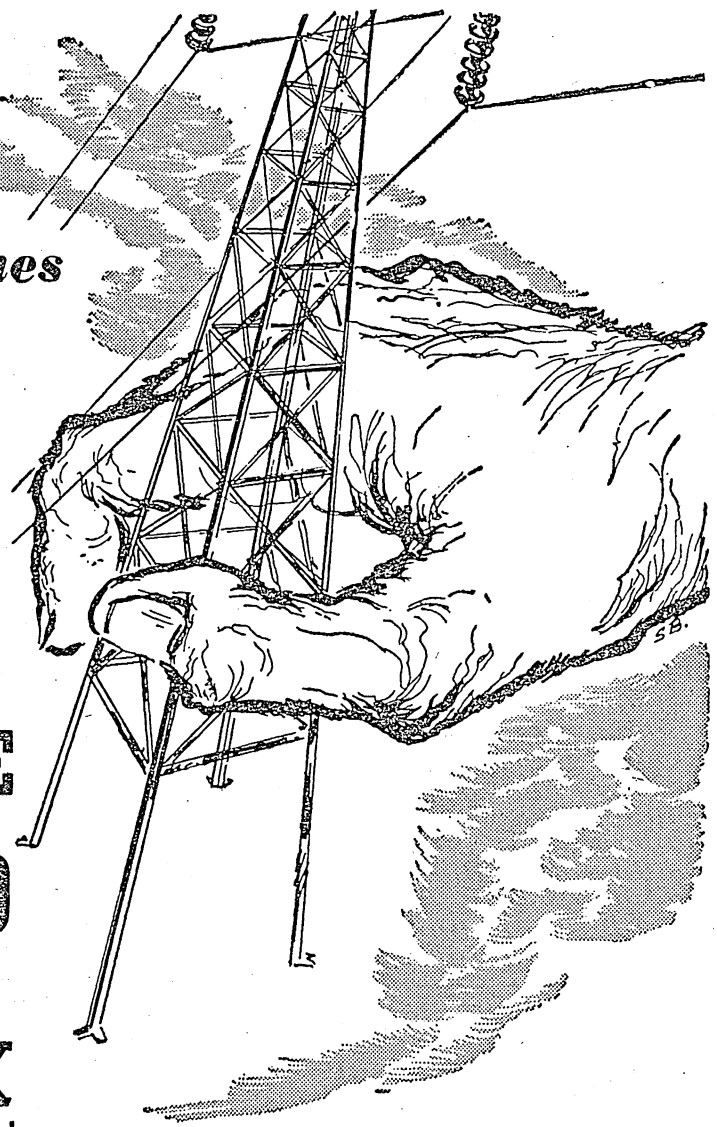
GINGER

Ginger is believed to be a native of Tropical Asia, and is cultivated mostly in India, West Indies (Jamaica and Barbados), Sierra Leone, Brazil, China, Japan and the Dutch East Indies. At present, the most important producers of commercial ginger are India, Jamaica and Sierra Leone. Kerala is the most important area in India producing commercial ginger, while in other parts of India, ginger is grown for local consumption as green ginger.

Fortunately, ginger in India, especially in Kerala, has all along been produced as a small holder's crop, the average size of a ginger block being not more than ¼ acre.

Exports of dried ginger from India, amounting to about 3,000 tons at present, are gradually on the increase. As compared to the quantities exported before the War, the present exports to Ceylon, Africa and some of the Middle East countries are on the increase, while exports to the United Kingdom, the U.S.A., Aden and Iran have fallen below the pre-war level.

During the last half century, India's commercial ginger has experienced serious slumps in prices, threatening the industry with extinction. Even today, the prices are at a very low level. The one factor which has maintained ginger production in



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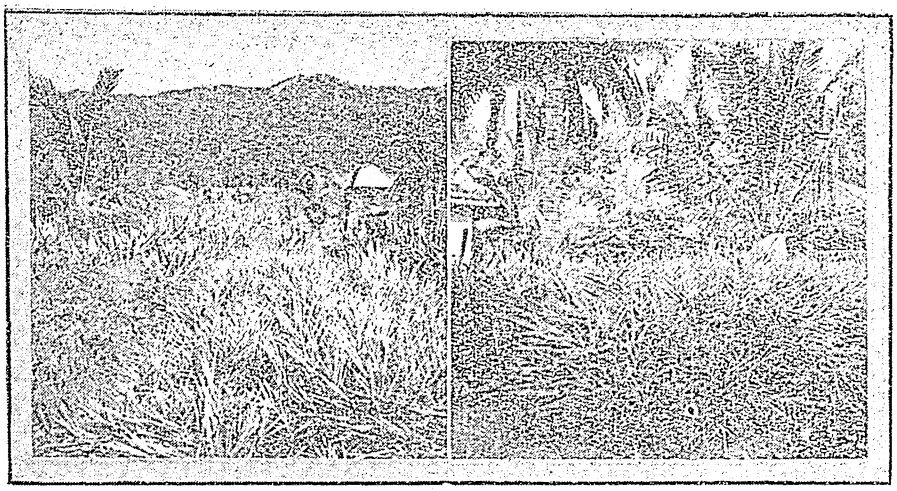
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Turmeric and ginger among coconut trees

India is that it has all along been a small holder's crop.

In the trade, ginger is known by the quality, method of curing and place of shipment, and is classified by such names as *Jamaica*, *Cochin*, *Brazil*, *Africa* and *Japan*. The produce of Kerala, the commercial ginger of India, marketed as *Cochin* is second only to *Jamaica* which is of the best quality.

There are two classes of ginger—one producing fibrous rhizomes and the other soft rhizomes, of which the latter is of higher quality.

From the point of view of international trade, we have to put the Indian ginger industry on a sound economic basis, so that it may be capable of facing competition. This can be best done by improving the quality of the country's produce by evolving soft (fibre-free) varieties by introduction and trial of exotic varieties, cross-breeding and/or selection, as well as by maintaining ginger as a small holder's crop in India.

TURMERIC

Turmeric cultivation in India can also be developed on exactly the same lines as indicated for ginger. Export of turmeric from India has been on the decline during the last few years, and is at present about 6,000 tons. This position can be vastly improved by extending the cultivation of selected superior varieties as a small holder's crop.

CARDAMOM

Cardamom is at present a plantation crop in India.

Although cardamom has been a commercial commodity of south-west India for hundreds of years, it is only since about a hundred years that its production on a plantation scale and development as an agricultural industry commenced.

In earlier times, like all hill produces, cardamoms, both for internal consumption and for export, were collected from wild cardamom plants in the jungles. Even today, a certain amount of cardamom is collected this way from our forests.

At present, cardamom is cultivated in the south Indian area of the Western Ghats from North Kanara in Mysore State down to Tirunelveli district in the extreme south of Madras State, i.e., Mysore, Kerala and Madras States.

A good proportion of the cardamom produced in India is used in the country itself, especially in north India, and only the surplus of about a 1,000 tons is exported. It is a crop which can be cultivated with comparative ease, and is, in fact, a valuable cash crop for cultivators living in areas where there are not many other cash crops.

The price level of cardamom has never suffered any serious fall, except during the First World War, and has generally remained at a satisfactory level. In 1950, the price went up to a phenomenal level of Rs. 12 per pound and remained more or less at that level till 1953, when it fell to Rs. four per pound. It rapidly rose again, and now remains more or less steady at Rs. ten per pound.

The hill districts ranging between elevations of 2,000 and 5,000 feet in which cardamom is cultivated are now being gradually colonized by farmers from the plains, with the result that large-scale cardamom plantations are being reduced to small holdings ranging from an acre to about 15 acres. This process is bound to extend to all cardamom areas in the course of a decade or two.

There is also a tendency towards a number of such small holders joining together and forming cardamom producing co-operative societies. This is a development in the right direction.

In Mysore State, cardamom is already a small holder's crop, being grown as a subsidiary crop in arecanut gardens and coffee and other plantations. The *male* system of cardamom cultivation prevailing in Coorg is also based on small holdings by the villagers.

Thus, in India, cardamom is also gradually becoming a small holder's crop.

CLOVE, NUTMEG AND CINNAMON

The cultivation of clove, nutmeg and cinnamon, the most important tree spices of the world, is only in its infancy in India.

Introduced into this country nearly 180 years ago by the East India Company, there are hardly 200, 300 and 350 acres, respectively, of these spices in India today.

The imports of clove and nutmeg in 1955-56 were 56,904 and 6,759 hundredweights, valued at Rs. 1,46,24,000 and 12,74,000, respectively. Information on the amount of cinnamon imported into India, however, is not available.

The main reason why the cultivation of these spices has not spread to any considerable extent in this country during the last 180 years, is that very little is known to the public about the advantages of and profits from growing a few of these spice trees in every homestead garden in the regions where the soil and climatic conditions are suitable for the normal growth and development of these trees.

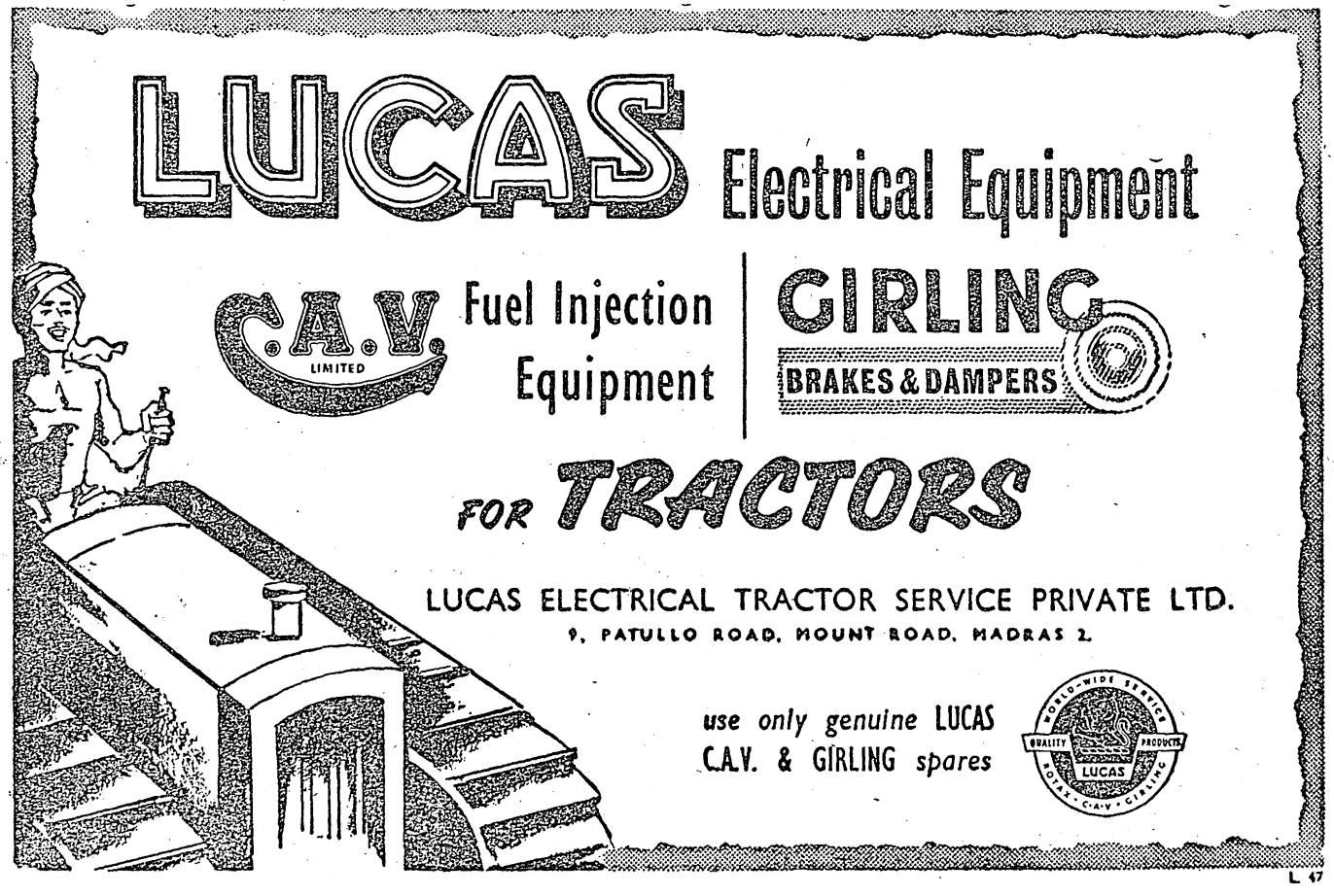
The irregular behaviour, especially of clove trees, the high cost of raising large-scale plantations of these trees and the consequent risks were also very important factors which operated against the extension of production of these spices in India on a plantation scale.

Recent surveys have, however, indicated that the easiest and the best way of extending the cultivation of these spices in this country is to grow them in homestead gardens and in small compact groves in all suitable, well protected, moist and cool situations in orchards and coffee, tea, coconut, arecanut, rubber, pepper and cardamom plantations. A household garden can have a dozen or two of trees of each kind. In such gardens, the cost of production will be insignificant, and whatever returns will be obtained from the spice trees will be a gain for the owner. By this method, clove, nutmeg and cinnamon production in India can be stepped up to the desired level in the next 15 to 20 years.

It has been repeatedly emphasized that mixed cropping is of the greatest importance in the farming economy in India, as it is unwise and very risky to have all your eggs in one basket. The soil and climatic requirements of all the spices mentioned above, except cardamom, are about the same, and they can all be grown as mixtures not only among themselves but also with other annual as well as perennial crops (orchards and other tree crops) at a minimum cost.

If the production of spices in India is encouraged and developed on these lines, it can be established on a stable economic basis at the desired level, capable of successful competition in the world markets and steadily earning foreign exchange for our country and cash for the growers.

I may repeat here that it was on the household garden basis that spices production in India survived through all these centuries.



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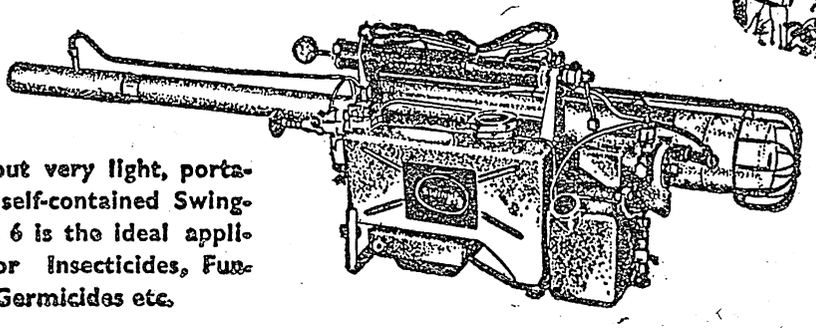
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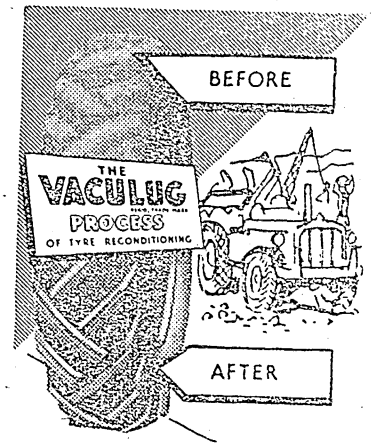
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READERS WRITE

GROUNDNUT-*JOWAR* MIXTURE

For the last five years, I have been trying a novel method of cropping which has given me very good results. I am a farmer of Berar (Bombay State).

The new method consists in sowing groundnut mixed with *jowar*. With this mixed cropping last year, I obtained 2,000 pounds of groundnuts per acre (average of 24 acres), besides 1,500 pounds of *jowar* grain, in addition to the fodder. My profit last year came to Rs. 1,000.

I first sow groundnut at 40 seers per acre. Thirteen days later, I dibble *jowar* with a six-foot space.

The distance between two rows of groundnut is 12 inches. This crop is sown with the help of a three-tined seed-drill with 12 inches between two tines. In the line of groundnut, the spacing between two *jowar* plants would be six feet, and between rows the same as in groundnut, viz., 12 inches.

This year, due to late rains, the groundnut did suffer badly, and only half the normal yield was obtained; but the *jowar* crop is fine and will give the full yield.

This system has given me the advantage of not reserving a separate area for *jowar*; it will surely be of interest to other farmers in Berar.

—Padgilwar Bandhu,
Kirloskar Agent,
Mangaldas Market,
Akola, Bombay State

IN THE U.S.S.R., TWO CROPS OF TOBACCO A YEAR

(*Contd. from page 27*)

off. Usually, the remaining branches give an additional eight to 12 leaves of good quality. The harvesting of the second crop is done in October before early frost sets in.

This method gives the Collective Farm an additional seven to eight thousand rubles per hectare. In 1956, the farm received 250,500 rubles for selling tobacco to the state, including more than 50,000 rubles from the tobacco of the second harvest. In 1957, the total income of the Farm from tobacco was more than 300,000 rubles, including about 80,000 rubles from the second harvest.

Today, the method of getting a second tobacco crop is beginning to be practised on a wide scale on the tobacco-growing farms of Ajaria.

THE STERILE COW THAT DIDN'T REMAIN DRY

(*Contd. from page 15*)

On 25th May, 1957, when the yield reached the maximum of 37 pounds, the implanted tablets of " Oestrogen " were removed. Two of these tablets were half absorbed, but the third one was almost completely absorbed, and only a trace could be removed.

The monthly milk-yield record was as follows.

1957	*Pounds*
April	766
May	969
June	827
July	731
August	681
September	591
October	630
November	646
December	658
1958	
January	635
February	21
Total	7,145

(in 306 days or ten calendar months, the normal lactation period of the herd)

The milk was occasionally tested for the fat percentage and the solids-not-fat content and found to have an average of fat, 5.25 per cent, and solids-not-fat 8.75 per cent.

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Who wants more food ?

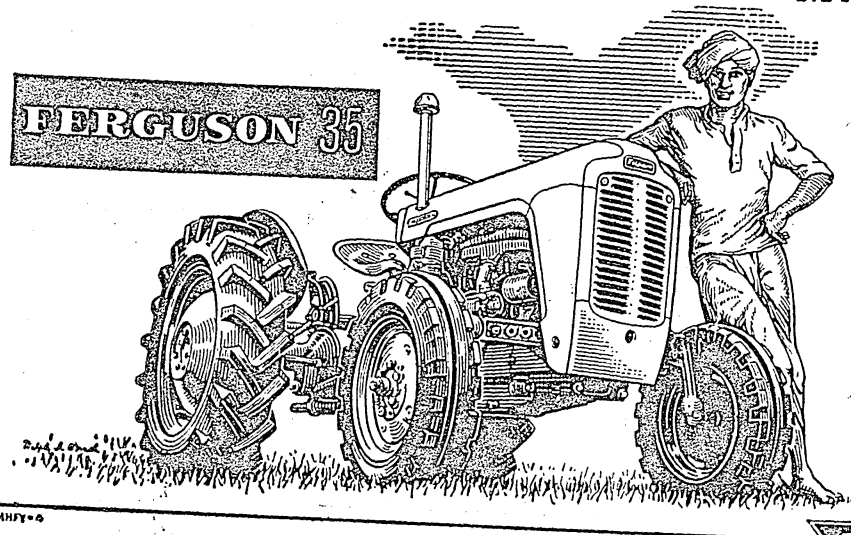
My basic job is to assist in raising this country's food production from its present low level—so low that we have to buy abroad.

The extent to which I can help is very often not realised—it certainly is not realised enough.

Whether it is wheat or rice—gram or grass—sugar or groundnuts—whatever it is, only I can reliably and economically:

- **Have the soil ready for the rains or water,**
- **Prepare the best tilth to suit the crop,**
- **Sow quickly and well on the right day,**
- **Give the crop attention whilst it grows,**
- **Harvest at the right time,**
- **Do, in time, all those never-ending duties such as agricultural haulage, soil conservation, water distribution and so on—which mean the difference between shortage and enough.**

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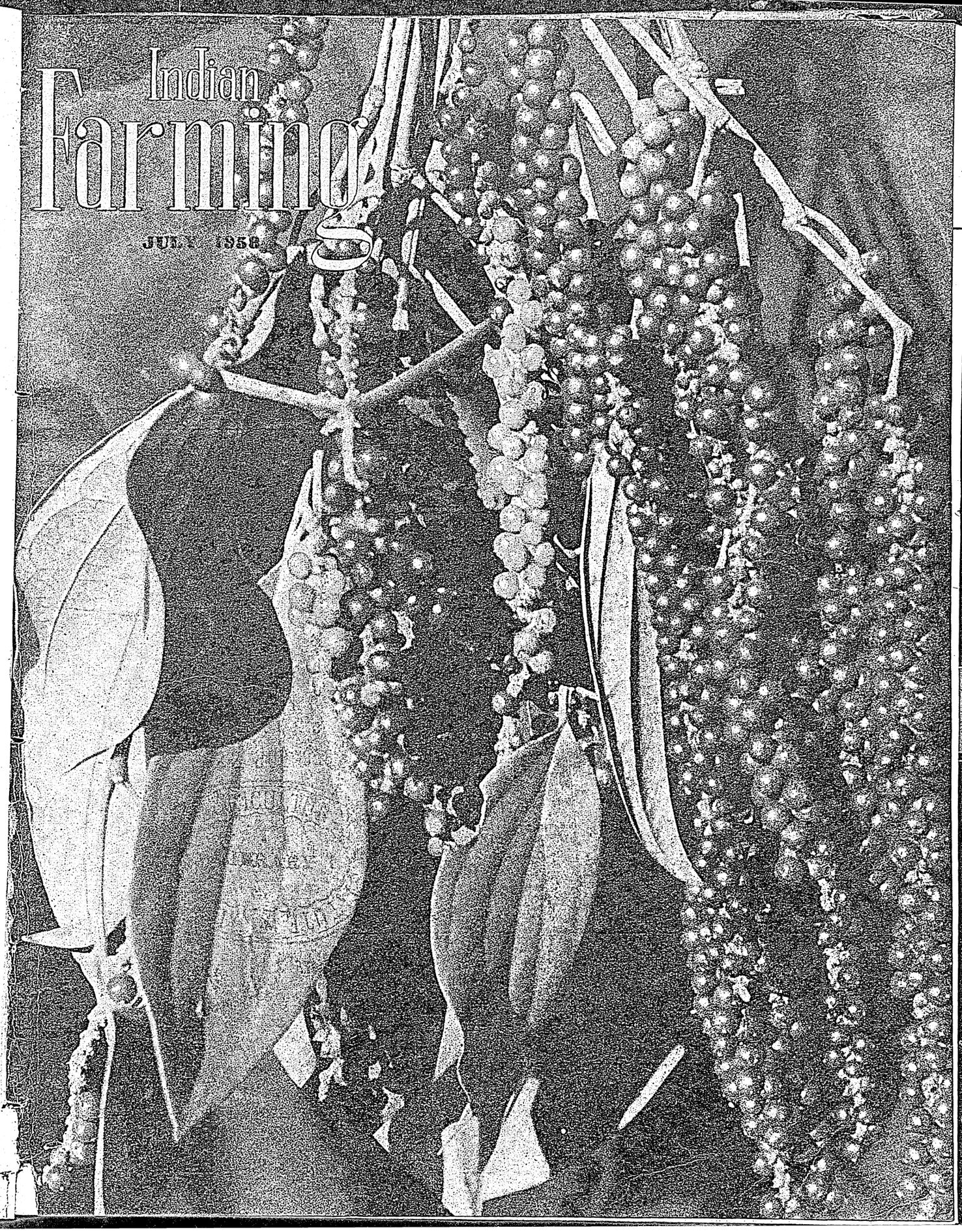
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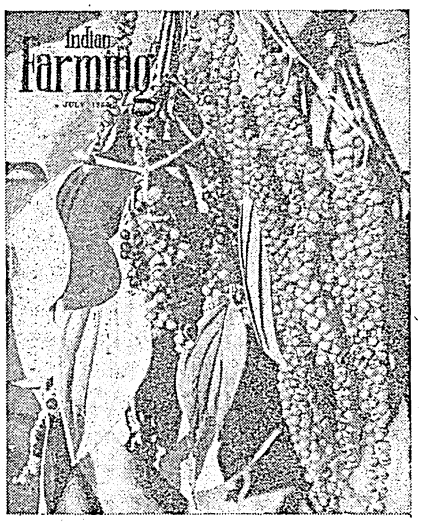
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Photo by H.K. Gorkha

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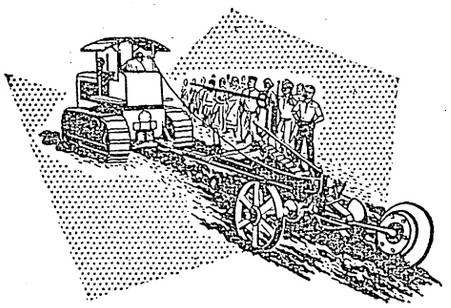
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Milestones in Mechanised Agriculture—V.



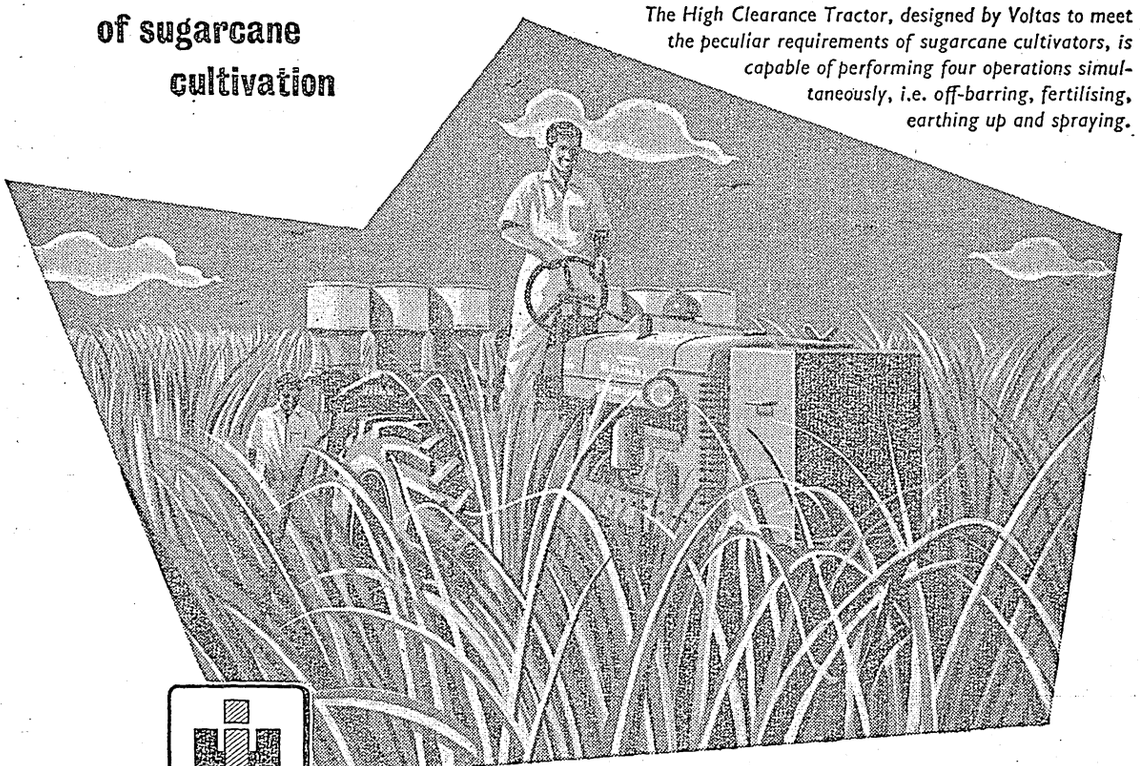
FIRST

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It was Voltas' predecessors, Volkart Brothers, who in 1938, *first* demonstrated conclusively, to Government officials and sugarcane technologists the benefits of mechanised sugarcane cultivation, at the sugarcane farms of the Phaltan Sugar Works (Bombay State). This demonstration paved the way for the introduction of mechanisation in the sugarcane fields in the country.

Recently, Voltas held a demonstration of a wide range of special-purpose machinery for the complete mechanisation of sugarcane cultivation at the same farm. An 'International' TD-18 Tractor, supplied to the Phaltan Sugar Works in 1938, also took part in the demonstration. This "Trojan" has worked over 40,000 hours and is still going strong! There are six more TD-18's in the service of the Phaltan Sugar Works. 'International' tractors are also doing a splendid job on numerous other sugarcane farms throughout the country. The new techniques evolved by Voltas for mechanising sugarcane cultivation have evoked interest in many other sugar-producing countries.

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MORE JOWAR

A 35 per cent increase in *jowar* grain yield and a 54 per cent increase in *kadbi* (fodder) yield are being claimed for the 'improved' method of cultivation of the crop at the Jalgaon Government Farm in Bombay State.

TRIALS extending over three years at the Farm have shown that *jowar* farmers can as well give this improved method a fair trial, as it involves nothing that an average farmer cannot afford to do.

THE trials were conducted in the *kharif* season and under rain-fed conditions.

THE improved method as followed at the Farm involves an application of five cartloads of farmyard manure per acre, 111 pounds of superphosphate drilled at sowing and 200 pounds of ammonium sulphate, half drilled at sowing and the remaining half three weeks later. (Farmers give none of these.)

THE *jowar* (*Aispuri* variety) seed is drilled with a spacing of 24 inches between rows; farmers give an 18-inch spacing.

THE seed-rate (mixed seed) is three pounds of *jowar* plus six of *urd* per acre—just the same as adopted by farmers; two hoeings and three weedings (The same as farmers give.) are given by way of interculture.

THE additional yields of grain and *kadbi* increase the margin of profit by Rs. 20 an acre.

IT is clear that the farmer gets this additional gain by taking to the application of manures and fertilizers and by giving a little wider spacing to his crop.

THIS is attractive enough for farmers to give the method a fair trial, so that they can assess for themselves how far it is paying on their fields.

THE ENEMY AS A FRIEND

SCIENTISTS investigating into the cause of galls on *Terminalia chebula*, an economically important forest plant in Mysore State, found it to be due to two species of thrips.

DRIED *Terminalia* fruits are largely used in the dyeing and tanning industry, and also in Ayurvedic medicine.

ONE species of the thrips, the scientists saw, fed gregariously on the flowers by wounding and sucking the juice and causing galls to be formed on the flowering stalk; the damage they caused was considered serious. The second species caused galls of the shape of cashewnuts on the leaves.

WHILE the scientists were to consider suitable methods for the control of the thrips to save the plants from damage, the cultivators came out with the brighter side of the thrips' work: the galls were more valuable than the fruits, as they were being largely made use of in Ayurvedic medicines, and sometimes fetched as much as four times more money than the fruits did !

So the scientists are now also considering the possibility of releasing these thrips in *Terminalia chebula* plantations !



Shri Ronaq Ali

Raising Bonus-getting Crops

by
M.G. Kamath

"ONE way a farmer can make good money is by selling the grain he produces to the government seed store—he gets a 12½ per cent premium over the market rate for his produce," is the opinion of Shri Ronaq Ali, a farmer of Imalia (Bulandshahr).

This is what exactly Ronaq Ali is doing, but what he did not mention was: the grain he sells must be a good one, of an improved variety and suitable for distribution to farmers as seed. Ronaq Ali produces only such seed and the seed store pays him a premium for it.

Ronaq Ali not only produces good grains, but has also won prizes in crop competitions. He won the First State prize in Uttar Pradesh for his maize crop in 1955-56, and the Second State prize for wheat in 1954-55.

A SIMPLE TIP

Surprisingly, young Ronaq Ali's progressive farming started in 1950 with this simple tip from Agricultural Inspector P.S. Malik: he who levels his land becomes a rich man.

Next to levelling came bunding, then fertilizer use, and then sowing of improved seed. Ronaq Ali now grows only improved seed recommended by the State Agriculture Department.

Ali clearly remembers the details of the wheat crop that brought him 35 maunds 13 seers 5 *chattaks* of yield per acre and the State prize, and has been repeating them to the large number of farmers who have been visiting him.

This is what he told me.

"In June, I sowed *sanai* at a maund per acre; also applied 1½ maunds of superphosphate at sowing.

"I ploughed in the *sanai* in the first week of August; mixed it with five maunds of bonemeal per acre.

"I ploughed the field ten times more. Seven days before sowing, I applied 1½ maunds of a general fertilizer mixture (1/4 super+1/4 urea+1/4 bonemeal+1/4 ammonium sulphate) and two maunds of castor cake.

"I sowed the field early in the last week of October. Used *Pb 591* seed.

"In December, I topdressed the crop with ammonium sulphate at 30 seers per acre.

"I gave three irrigations and two interculturings to the crop."

PRIZE-WINNING MAIZE

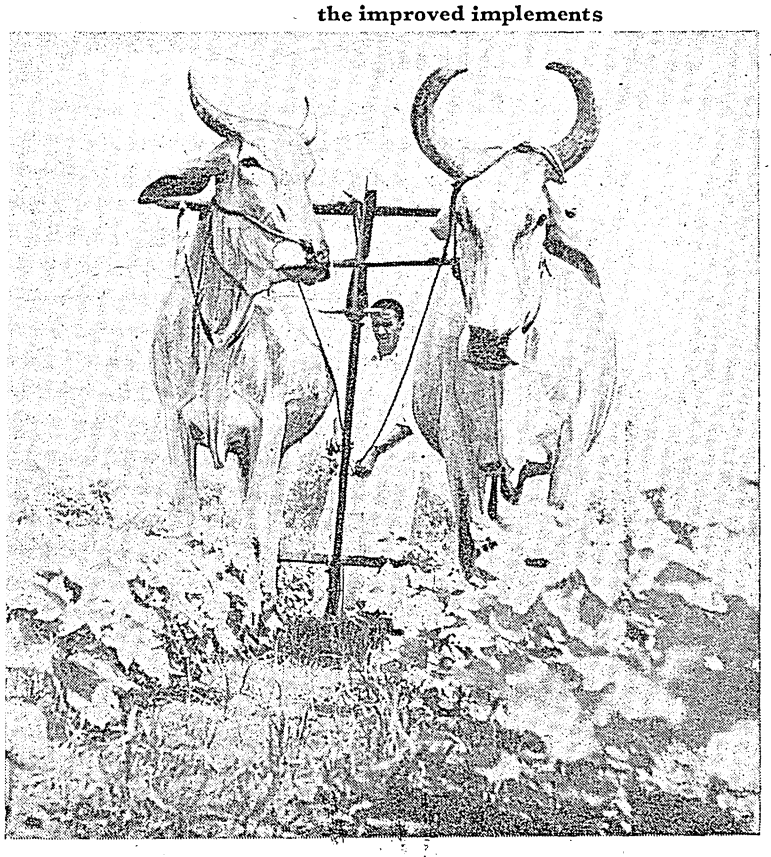
The prize-winning maize crop, in his words, was raised thus.

"The field had *methi* as previous crop. After the *methi* harvest, I broke the field 'open' in April.

"Then I dry-ploughed it twice, irrigated in the last week of June. I gave general fertilizer mixture at two maunds per acre and castor cake at three maunds per acre with the funnel.

"I ploughed the field again, sowed *T41* maize at six seers to the acre, in lines, two feet apart.

Hoeing a cotton crop with the cultivator. Ronaq has all the improved implements





Ronaq Ali discusses the prospects of sugarcane crop with Agricultural Inspector Malik

"I topdressed the crop with 30 seers of ammonium sulphate nitrate mixed in well-powdered compost, in August.

"Topdressed the crop again after a month with 15 seers of the same fertilizer given in the same way.

"One interploughing, one interculture and one extra irrigation completed the attention to the crop."

He obtained an acre-yield of 50 maunds 17 seers 10 *chhataks* of maize from the crop.

The cultural schedule, Ronaq Ali admitted, was drawn up by Malik. Ali faithfully followed it.

"Because of the good yields I am getting, sowing improved seeds and proper fertilizer use have now come to stay in Imalia," was Ali's comment.

CLEAN CULTIVATION

Added to this, the farmer has become a great stickler for clean cultivation. When I visited the farm, a demonstration was in progress on the interculturing of cotton. Ronaq Ali was demonstrating the working of "Singh" cultivator in his cotton crop. "I want to demonstrate to my neighbours how the bullock-drawn implement saves time and energy over hoeing the crop with human labour," he explained.

Ronaq is now the proud owner of a tube-well.

"Worked hard for it"—his suave remarks.

It won't be surprising if one of these days this progressive farmer hits the headlines with a top yield for the country. He is sure heading for it.

income from jute fields up 23 per cent

by

K. L. Gurnani

Extension Agronomist

Jute Agricultural Research Institute

Barrackpore

SINCE 1953, the Extension Wing of the Jute Agricultural Research Institute at Barrackpore (W. Bengal), has been conveying improved methods of jute cultivation to farmers through practical demonstrations on the farmers' fields themselves. Thus, not only the research results have been conveyed to farmers, but also farmers' problems as seen in their fields have been conveyed back to the research workers at the Institute for finding out solutions.

At the Institute, research has proved that the yield and the quality of jute can be very much improved by taking to improved methods of cultivation.

IMPROVED METHODS

The improved methods include:

(1) using improved varieties of seed ;
(2) sowing in lines with drills ;
(3) interculturing with wheel-hoes ;
(4) applying organic manures and fertilizers to the crop ;
(5) adopting proper plant protection measures to control pests and diseases ;
(6) making use of improved techniques in retting and extracting the fibre ;
(7) practising double and triple cropping.

EXTENSION CENTRES

The Extension Wing of the Institute has set up Extension centres in different jute-growing areas. Work is at present in progress in seven such centres in the 24-Parganas district of West Bengal. During the last four years, a large number of demonstrations have been carried out on farmers' fields.

Farmers who have been following the improved methods have found that they make better profits from their jute crop. There has been a reduction of up to 17 per cent in the total cost of producton including operations and materials and, at the same time, yields have gone up by about 3.53 maunds per acre. This has brought an additional income of 23 per cent to the jute grower.

LINE-SOWING

Line-sowing of jute with the drill evolved by the Institute is enabling farmers to use wheel-hoes for interculturing between the rows of the crop. These two labour-saving devices have brought down the total cost of interculturing of the crop by 50 per cent.

DOUBLE-CROPPING

Those who have followed double cropping for their jute have found that the system gives them an additional income of about Rs. 69 per acre from the second crop of paddy. An additional income of about Rs. 63 per acre has been obtained by growing pulses after a late jute crop. With vegetables grown after jute under irrigation, the extra income obtained has been of the order of Rs. 265 per acre.

On low-lying lands subject to floods or *beals*, or on lands with irrigation facilities, it is possible to grow a third crop in the sequence jute—paddy—pulses. This third crop has brought to farmers an additional income of about Rs. 54 per acre.

The Extension Wing is now planning to open six more jute development blocks in the main jute-growing states—two in West Bengal, and one each in Uttar Pradesh, Bihar, Orissa and Assam. These blocks will be attached to the jute research substations of the Institute to be set up in these states. Each block will have five Extension centres to cover 50 villages, each village will have three demonstration plots. This means that there will be 1,050 demonstrations in improved practices in these states. Groundwork is already being done to start these blocks in Assam, Uttar Pradesh and Orissa.

These demonstrations will initiate more farmers in the art of producing more and better quality jute at a lower cost; it will also initiate them in the practice of double and triple cropping so that the land can be fully utilized for more profits.

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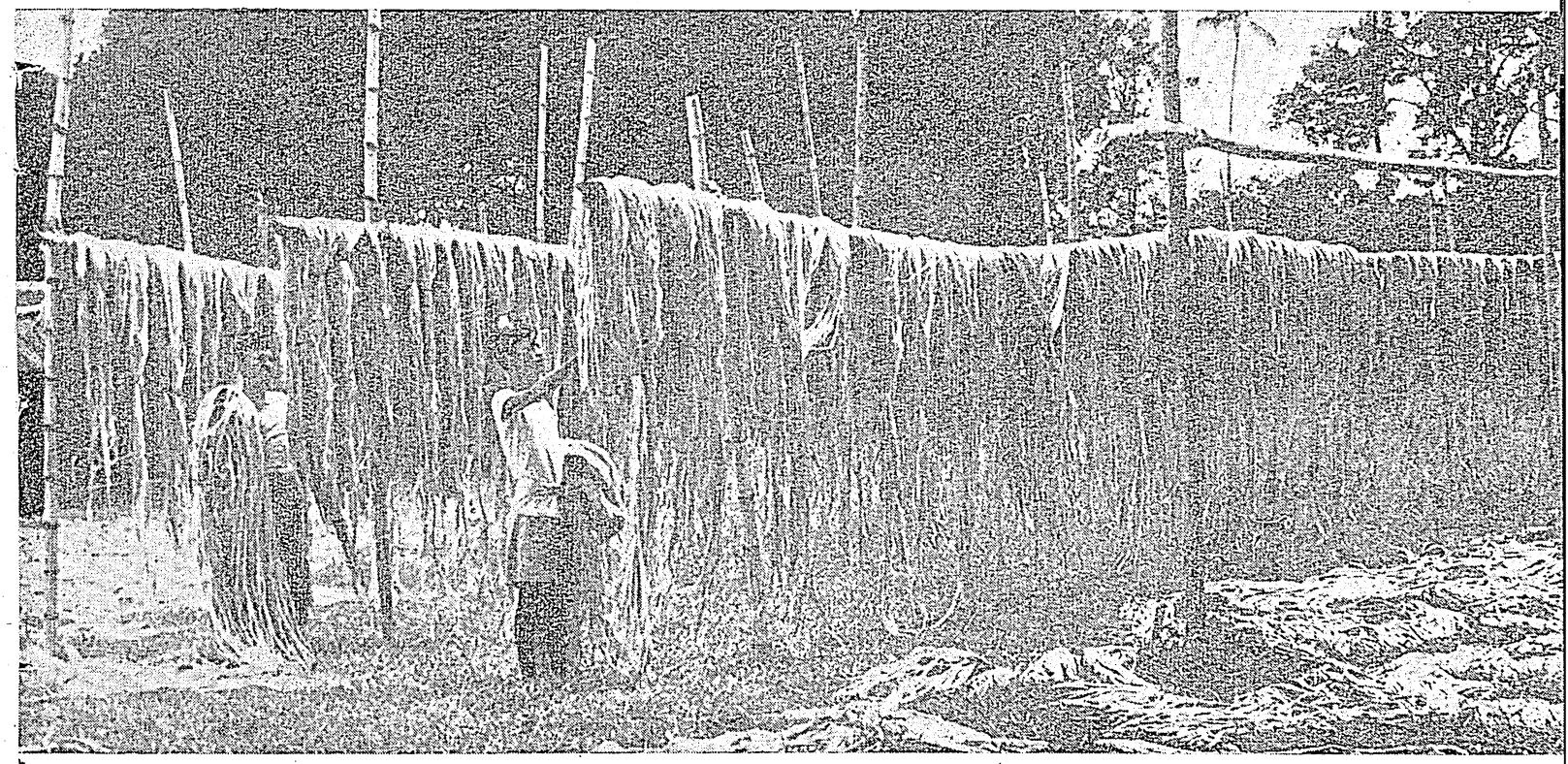
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The Government of Madras present in their book entitled "Memoirs of the Department of Agriculture, Madras" the record of much useful work done by the Madras Agricultural Department in the field of Agricultural Research from its inception, in a form that might help both the scientists and the laymen. The price of this valuable publication has been reduced from the actual cost of Rs. 36-10-0 to Rs. 22-8-0 per copy. It can be had from the Superintendent, Government Press, Publication Department, Mount Road, Madras-2.

Write for your copy immediately.

Proper drying of jute fibre after extraction helps improve fibre quality





Inside a *pan* garden

Delicate *Pan* Needs Specialized Care

by

B.G. Nikam and **C.N. Mahadik**

Assistant Plant Pathologist — **Research Assistant (Botany)**

Agricultural Research Institute
Gwalior

PAN is proving to be a good cash crop in Madhya Pradesh. A total of 4,720 acres in 22 districts of the State is under the *pan* crop, giving an annual income of about two crores of rupees.

Pan (*Piper betle* Lin.) is a delicate plant, and requires utmost care in its cultivation. Raising of *pan* gardens is a specialized job mostly undertaken by hereditary *pan* growers.

Pan plantations are invariably located on higher elevations with friable clay loam soils rich in organic matter and from whitish to blackish in colour. In Madhya Pradesh, *pan* cultivation is mainly concentrated in the districts of Gwalior and Chhatarpur.

Fresh soil, i.e., soil rich in organic matter obtained from virgin land or a tank, is added at the rate of 20 to 30 cartloads per acre at the time of establishing a plantation, and thereafter every year in the month of March.

PREPARATION OF LAND

The average area of a *pan* garden in the State does not exceed half an acre, as a larger area is difficult to manage. The land selected for establishing a *pan* plantation is ploughed and reploughed with a *desi* plough a number of times. Well composted farmyard manure is then added to it at the per-acre rate of 40 to 60 cartloads.

The land is then levelled with a wooden leveller, and trenches are dug all round the garden to drain off the excess water from the root zone. Ridges and furrows 300 feet long are next opened two feet apart, preferably from east to west.

VARIETIES

Several varieties differing in leaf shape, colour, taste and aroma are grown in the State. Some of the

well known varieties are the *Deshi*, *Kapuri*, *Gangori*, *Bangla*, *Belhari*, *Maudraji*, *Barigar*, *Phaphade*, *Kakeri* and *Malvi*.

Leaves of the *Deshi* variety are long, broad, thin and green in colour, with a green petiole. They are more tasty than the leaves of the other varieties, which are thicker and light green in colour.

PLANTING

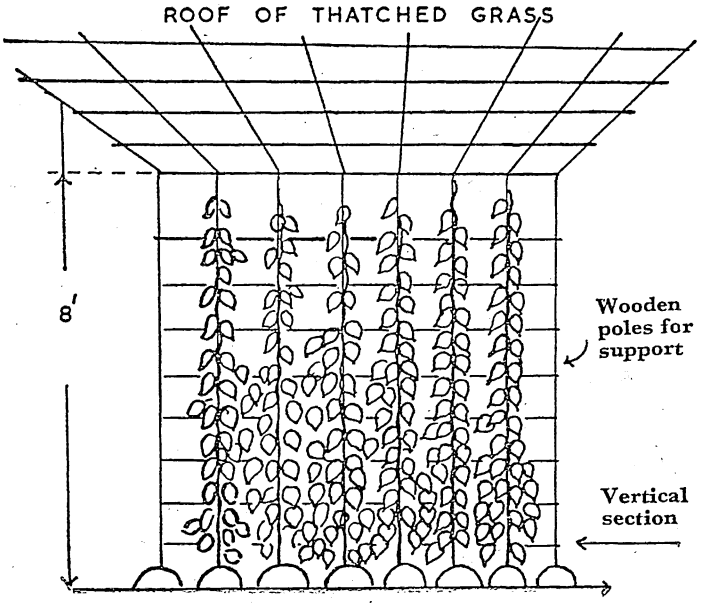
Hard stem cuttings from year-old healthy plants are used for starting a new plantation. Tender parts of the old vines are rejected and cuttings with one bud and a leaf are used. The length of each cutting is not more than four inches.

The cuttings are planted close, their buried parts touching each other, in beds $1\frac{1}{2}$ feet $\times 1\frac{1}{2}$ feet in the furrow. Two cuttings or sets are planted per hill. The portion with the bud and the leaf is kept above ground.

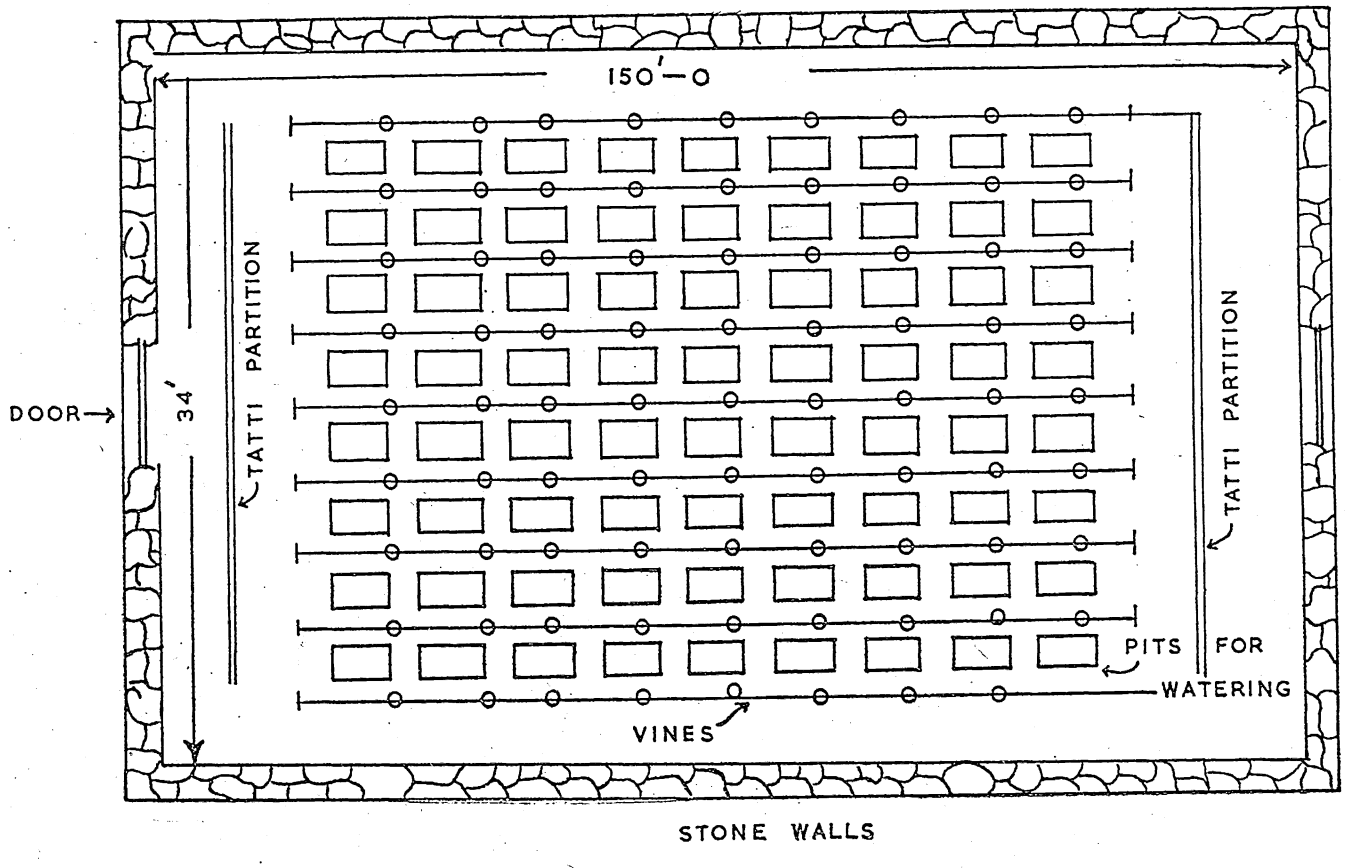
Planting of a new garden is always done in the months of February and March. Eighty thousand cuttings are required for planting an acre of a new garden, and they cost about Rs. 1,600.

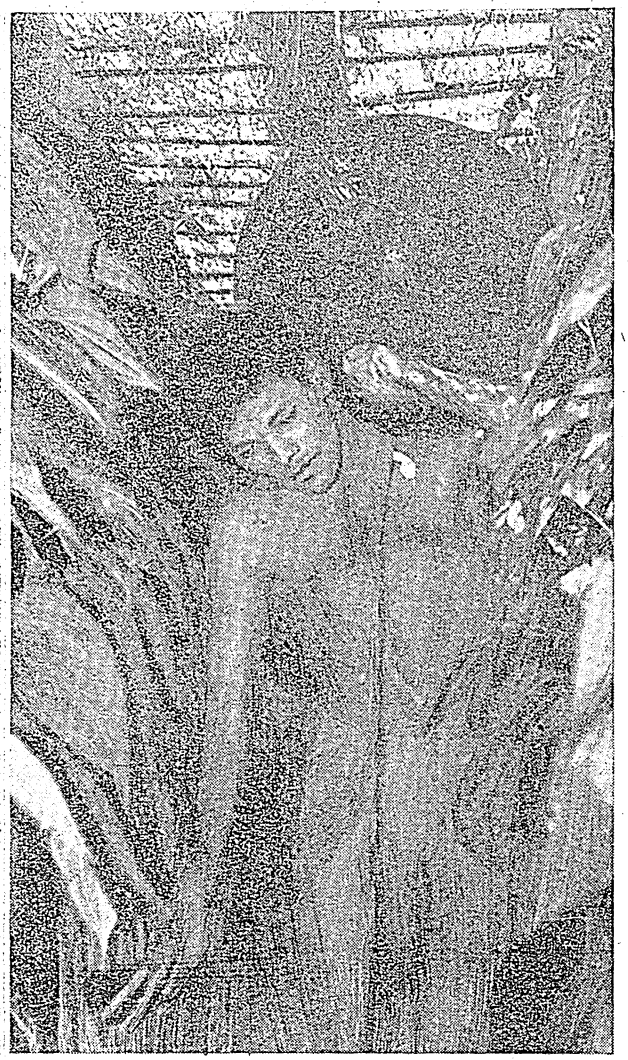
The crop requires a moist cool climate for its proper growth. In Gwalior district, where the seasons are extreme, a stone wall is erected all round the plantation as a wind-break to exclude hot and cold winds. In other parts of the State, wooden or bamboo *tattis* are used for the purpose.

The plantation is covered with a roof of thatched grass, allowing only diffused light to pass through.



LAY-OUT OF A *PAN* GARDEN





Watering the vines with *gharas*

Wooden poles or split bamboos are erected as supports on which the vines are trailed These poles are connected to each other by means of cross-ties.

IRRIGATION

An abundant and continuous supply of water is absolutely necessary for a *pan* garden. The soil must be always kept saturated with water by frequent irrigation.

In Gwalior district, a special system of watering is adopted. Water is sprinkled over the beds from big earthen pots (*gharas*).

Three to four waterings a day are given from February to May. In winter, watering is done at intervals of five to six days. During the rainy season, irrigation is generally not given; it may be given as and when necessary, if there are long dry spells.

The planted sets generally take root in three to four weeks.

MANURING

Castor cake, linseed cake, sesamum cake or *nim* cake is applied as manure in doses of 15 maunds to the acre.

The cake is first rotted in water in a big earthen pot for six to eight days; it is then applied in the form of a paste.

Fourteen doses of manure are given in a year. The first dose is given 15 days after the plantation, and the subsequent ones at intervals of 15 days from February to June. From July to November, manuring is done at intervals of one month. From December to January, no manuring is done.

During the rainy season, sweet oil is also added to the cake at eight parts of cake and one part of oil. Irrigation follows the application of manure.

There is a belief that application of buttermilk as manure in the summer season helps in checking certain diseases like *kata* (*Phytophthora parasitica*, var., piperina).

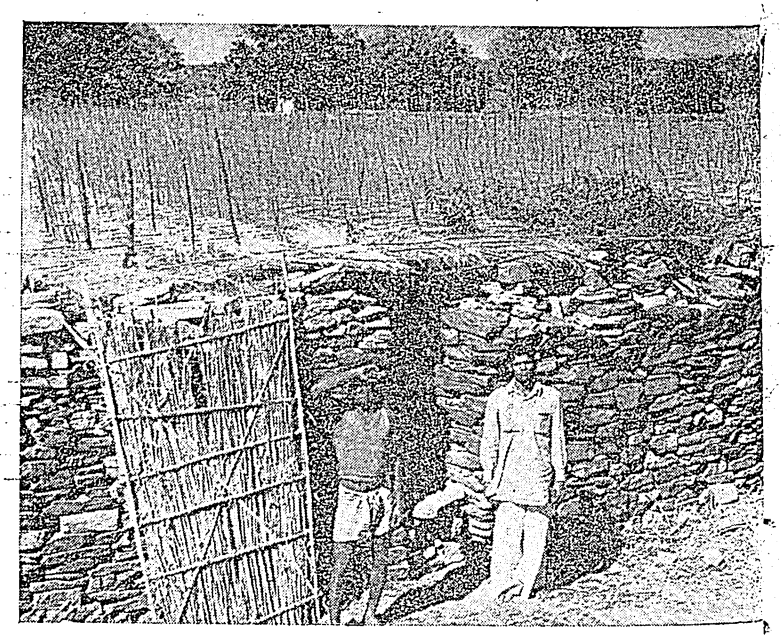
CARE OF THE PLANTATION

Weeding and stirring up of the soil are done every month before the manure is applied. Every winter, the roofs are thatched with fresh grass. *Tattis* or stone walls are repaired as and when necessary.

Watering, manuring and lowering of the vines are to be undertaken at the proper time. Planters should be on the alert to see that fire does not break out in the garden during the hot days of summer. The garden should be kept absolutely clean of dead and diseased vines and fallen leaves. Surplus water during the rainy season should be drained off by providing proper drains all round the garden.

Earthing is done four times a year just after manuring. Finely crushed fresh soil is sprinkled in the furrows and piled along the ridges. Twenty cartloads of fresh soil per acre are added at the time of earthing.

A stone wall round a *pan* **garden serves as a wind-break**



LOWERING OF VINES

When a *pan* vine reaches the roof, it is stripped of all the leaves on it except the young ones at the top. The entire vine is lowered and then trailed on the ground along the ridge. The growing shoot is bent upwards and then tied to the bamboo support with leaves of *kans* (*Saccharum spontaneum*) grass.

Lowering of the vines is done as many times as the vine reaches the roof. The operation is generally carried out after earthing, so that the lowered stem remains uncovered on the ground till the next earthing.

When these lowered creepers take root from the nodes which come into contact with the soil, the remaining part of the stem is carefully removed.

HARVESTING

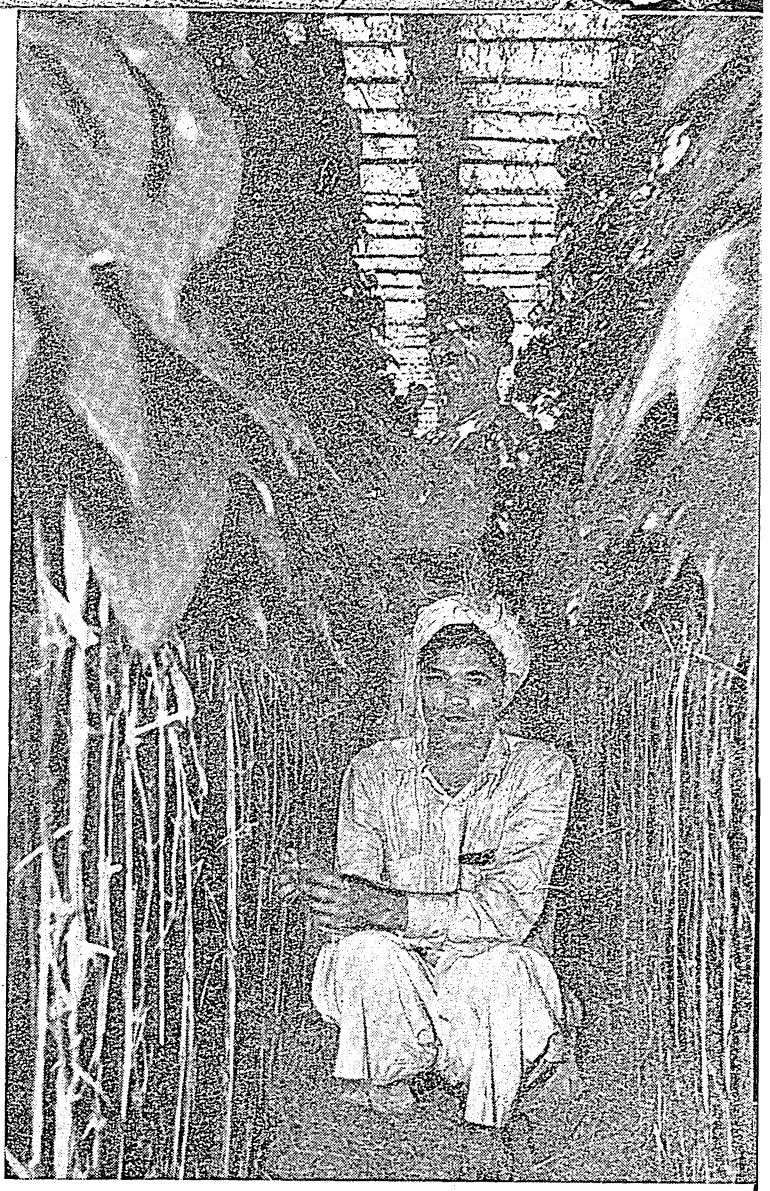
Mature leaves from the lowered parts of the vine are plucked. Plucking starts from August-September in a new plantation and from June-July in an old one.

Usually, four to five leaves are plucked at a time from a vine in old plantations and two to three from a vine in new ones. Every year, about eight to ten pluckings are possible in new plantations. On an average, 50,00,000 leaves per acre from old plantations and 15,00,000 from new ones are harvested annually.

ECONOMICS OF *PAN* CULTIVATION

The cost of *pan* production has been found to vary from locality to locality. On an average, it is as given below.

First year	*Cost per acre (in rupees)*
Preparation of land, ploughing, levelling, etc.	50
Construction of stone walls or *tattis*, *barejas*, roofing, etc.	5,000
80,000 *pan* sets	1,600
210 maunds of cake (14 doses of 15 maunds each) at Rs. 9 per maund	1,890
Sweet oil, six maunds, given during the rainy season (July, August and September) at Rs. 60 per maund	360
Ten permanent labourers at Rs. 30 per month for planting, watering, thatching the grass, etc.	3,600
Land revenue	100
Total	12,600



Lowering and trailing of vines is important in *pan*-growing

Second Year	
Labour	3,600
Manure and oil	2,250
Grass, bamboo, etc.	1,000
Land revenue	100
Total	6,950

Third Year	
Same as that in the second year.	6,950

The total expenditure in three years comes to about Rs. 26,500 per acre, i.e., Rs. 8,833 per acre per year.

An income of about Rs. 34,000 (Rs. 10,000 in the first year, Rs. 14,000 in the second year and Rs. 10,000 in the third year) is obtained in three years giving a profit of Rs. 7,500, i.e., Rs. 2,500 per acre per year.

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25 nP

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Farm Bulletin No. 47

"How to Utilize Carcasses"

50 nP

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The Business Manager

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

New Delhi-2

BEAT BACK THE BOLLWORM

RECENTLY, a report appeared in the press that the cotton crop in Surat had been damaged by the 'boll-weevil' pest and that the yield of cotton was expected to go down as a result.

Agricultural experts of Bombay State who looked into this said the damage was not due to the boll-weevil, but by as bad a pest, the pink bollworm. The damage varied from 25 to 40 per cent in cotton fields, and the yield did go down considerably.

The reduction in cotton yield in the tract was found not merely due to the attack of this pest but also to the unfavourable weather conditions that had prevailed.

THREE CAUSES

Why should the pink bollworm appear in large numbers sometimes ? Departmental experts point out to three main causes: keeping the crop of the previous season in the field longer than usual; ratooning the cotton crop and growing cotton after cotton instead of following a system of rotation of cotton with other crops.

Apart from these causes, if *bhindi* or some weed on which the pest can feed and breed and pass on from one season to another easily, is to be found growing near the cotton fields, this will also help the pest multiply and attack the cotton crop.

The Indian Central Cotton Committee has been telling farmers that they can easily prevent any damage from the pink bollworm by taking a few simple steps.

CONTROL MEASURES

The Committee has been advocating, for the last many years, that the stems of the cotton crop after picking should not be cut but completely uprooted. For this purpose, 'plant pullers' can effectively be used. If the stems are cut and not uprooted, they will give out new shoots on which the bollworms breed and show up in the next season.

The second measure recommended is the use of insect-free seeds. A seed can be freed of the pest by fumigation before sowing.

To effectively control the pest, cotton should not follow cotton in successive seasons in the same areas. It should rotate with a cereal like *jowar* or any other crop commonly grown.

Another effective step would be to avoid growing of *bhindi* or other such vegetable crops near the cotton crop. These harbour the pest during the summer.

All infested and shed bolls should be cleared and burnt so that the pests hiding in them may be destroyed.

To be effective, it is emphasized, these measures should be taken on a collective rather than an individual basis.

22 JUL 1958
AGRICULTURAL LIBRARY

Plans To Plant

Glyricidia

KERALA'S Department of Agriculture has placed before the people of the State a new proposal to grow Glyricidia—a hundred plants at least for every acre of paddy grown and one plant for every coconut tree in the State.

With about 20 lakh acres under paddy and 660 lakh coconut trees in the State, this would mean a colossal 26.6 crores of Glyricidia to be planted. But the Department has proposed that this work be done in five years, with one crore plants to be planted (either seed, seedling or cutting) during the current year.

RAISING LAND PRODUCTIVITY

The reason for giving so much importance to Glyricidia is this. Kerala is producing only about half of her requirements of rice. Production cannot be increased unless the productivity of the land is raised. One way of doing this would be to provide green manure to the paddy lands.

Once, the Kerala farmer used to apply green manure to his crops. Due to the cutting down of trees continuously, green manure is not available in sufficient quantities. Hence, the need for growing a green manure crop.

Among the green manure crops, the State's choice has fallen on *Glyricidia maculata*. It grows quickly, produces a large quantity of green leaf which easily rots and mixes with the soil.

A CAMPAIGN

The State's plan for achieving this year's target is to take up this work on a campaign basis. There will be 'Glyricidia Weeks' observed all over the State. Each district is given a target and in each district, each taluk and block as well as each worker has been given a target.

Glyricidia not being new to the State, there are already a large number of plants to be found here and there. They have arranged for seeds from these plants to be collected. The Department also buys seeds for further distribution to farmers.

It is better to raise Glyricidia seedlings in a nursery than planting seeds in the field. In July-August, it is a common sight to see a large number of seedlings growing under the older plants. These seedlings also could be lifted and transplanted.

In Kerala, they plan to plant cuttings also. From the existing plants, some 20 to 30 lakhs of cuttings are expected to be collected this year.

'GLYRICIDIA WEEK'

June is the month for planting Glyricidia. The monsoon then has just set in but has not become heavy. The first week of June each year, therefore, will be 'Glyricidia Week.'

Glyricidia is excellent for growing on either side of the road. It can be planted on boundaries of house compounds, fields, along fences, along roadsides and in all vacant spaces. It is excellent for replacing useless shrubs at present used for fencing purposes. As a fence or a hedge, Glyricidia has to be planted three feet apart, allowed to grow straight for about five feet and then allowed to branch off.

One more point is in favour of Glyricidia being taken up for mass planting. As a beautiful, medium-sized tree producing clusters of light pink flowers all round the tender stems, it will add to the beauty of the landscape of Kerala.

Protect Your Chicks against COCCIDIOSIS

by

S.B.V. Rao
Poultry Research Division
Indian Veterinary Research Institute, Izatnagar

ALL over the world, wherever chicks are raised on a large scale, a disease causes a heavy toll in brooder houses. The death rate is heaviest in chicks between three and six weeks of age.

The disease is called *Coccidiosis* or bloody diarrhoea. It is caused by a parasite called Coccidia or *Eimeria*. Some species of these attack older chickens too. The deadliest among these is *Eimeria tennellum*.

When birds are infected, the parasites are passed out in their droppings. In 24 to 48 hours they develop and become infective again. Chicks take up this parasite from the contaminated litter, water, food or greens. If they take in a few parasites only and if the chicks had not been previously exposed to infection, they develop a resistance to the disease. But when a number of parasites get into the digestive tract of the chick they enter the cells of the intestines, multiply rapidly and damage the cells to such an extent that the chick dies.

Eimeria tennellum attacks the caeca (blind pouches at the junction of the small and large intestines) in young chicks up to ten weeks in age.

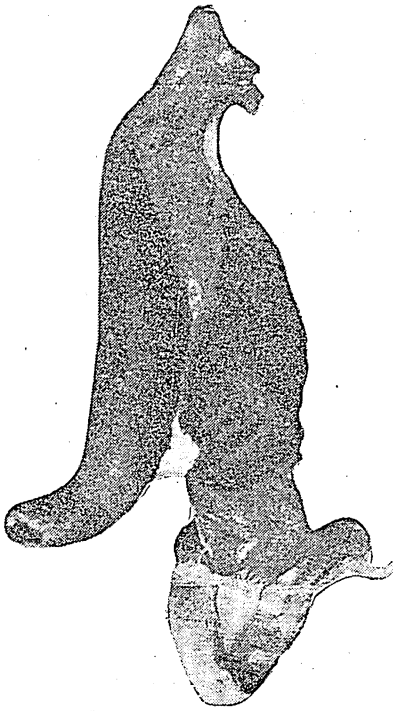
Disease infection is also carried by wild birds and adult fowls (which carry the disease germs without harm to themselves), dust-laden wind, flies and the feet of attendants.



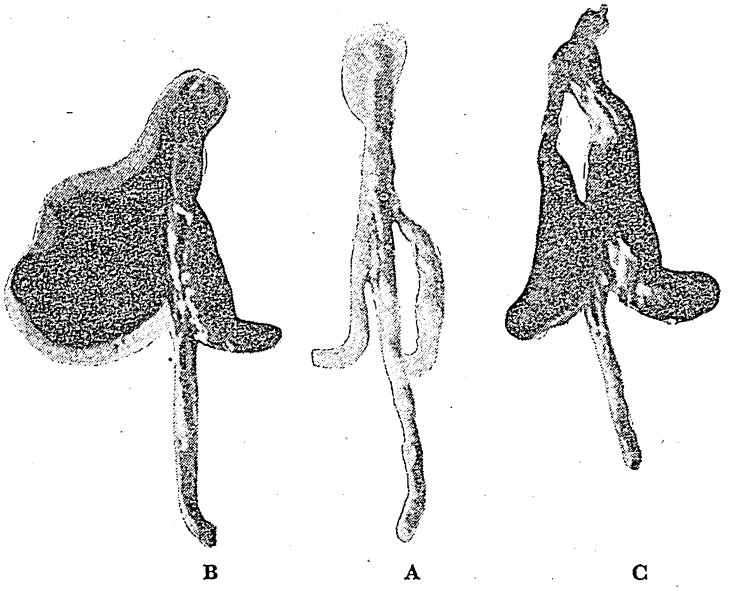
A chicken ailing from coccidiosis



A chicken dead of coccidiosis showing 'bloody' caeca (pulled out)



Bloody caeca. One cut open and the other unopened



A—normal caeca, B—bloody caeca cut open, and C—two bloody caeca

I had occasion to see an ugly outbreak of bloody diarrhoea among three-week old chicks raised on the wire-net flooring of a battery brooder. In this case, the infection came through the lucerne that was grown in a sewage-fed farm and given to the chicks.

FIRST SIGN

The first sign of the disease in young chicks of three to 12 weeks of age is droopiness. Young chicks crowd around with ruffled feathers, wings hanging down and eyes closed. This is a pose that is peculiar to the disease. The uneasy attitude is seen in chicks two or three days before they begin dying off.

Droppings of infected birds contain blood. The amount may vary from just enough to tinge the faeces to a bloody discharge. However this is only seen in the early stages of the outbreak, say, by about the fifth day of infection, and may subside later, though the disease may still continue. In some cases, the bloody droppings may not show up. Hence, it is necessary to examine carefully the caeca or the blind pouches in dead chicks when you find the losses are on the increase.

The heaviest mortality occurs during the first week or ten days after the blood sign is noticed. After this the number of deaths may go down, though continuing for three to four weeks. Those which survive get a severe check in their growth.

To diagnose a case of coccidiosis, the caeca of the dead bird are taken. Usually, they have sufficient blood in them to give them a reddish appearance. The caeca may be normal in size, or distended, or may contain caecal core and accumulation of a greyish or yellowish-white and juicy material. In case these changes in the caeca are not noticed, it is better that the contents of the caeca are put in a potassium dichromate solution (2½ per cent) and sent to the nearest veterinary laboratory for a check-up.

SANITARY PRACTICES

It is good to remember that no poultry farm is free of this disease. To prevent it, you have to keep the parasites under check in chick-raising yards and brooder house floors. Sound sanitary practices which will be of great help in this regard are providing young chicks with hard cement floors, or at least macadamised with tar and granite grit and levelled so that it can be thoroughly washed periodically between hatches. The droppings should be regularly removed and the floor kept dry with some easily removable litter during brooding. Sanitary chick fountains raised up on wooden or wire platforms should be provided.

Sanitation alone cannot fight the disease with success. At best it can keep the infection down. When there is an annual attack, drugs like sulphamezathine or sulphaquinoxaline (embazine) should be used for medication without delay. In fact, every poultry farmer should keep these drugs handy and follow the directions enclosed with the drug while using them. Medicating the drinking water for three days, and resuming it again for another three days after a break of two days builds up an effective resistance in the chicks against the disease. However, this has to be done at the very first warning sign and before any damage to the intestinal wall of the chick has been done by the parasite.

Our Trees

PAKAR

the tree of parks and avenues

by
M. D. Chaturvedi

A HANDSOME tree, the *pakar* is cultivated solely for shade and shelter. It is a close cousin of the banyan and the *pipal*, enjoying distinction in its own rights.

Botanically, the *pakar* is known as *Ficus infectoria*. Its names in other Indian languages are: *palakh, pilkhan, khabar, pakar*, Hindi; *kel*, Marathi; *Juvvi*, Telugu; *bassari*, Kanarese; *jovi*, Tamil.

The *pakar* is distributed throughout the Gangetic basin, the Western Ghats and upper Deccan. In the sub-Himalayan tract, it is known to go up the valleys up to an elevation of 4,000 feet. It grows best on moist loams, avoiding dry tracts of western India.

Nearly evergreen, the *pakar* loses its leaves only for a short time in hot and dry localities. The new leaves arrive in March-April. The leaves are thick and leathery, with a characteristic shiny surface, and when plucked exude a milky juice, characteristic of the trees of the fig family.

The stem of the *pakar* is fluted, following the general pattern of fig trees; the bark is greenish grey. Aerial roots emanate from its branches occasionally, but they do not form fresh columns to support the crown as happens in the case of the banyan. The tree attains fairly large dimensions, not so much in height as in spread.

The fruit of the *pakar* ripens around May-June, remaining long on the tree, and is avidly sought by birds and monkeys.

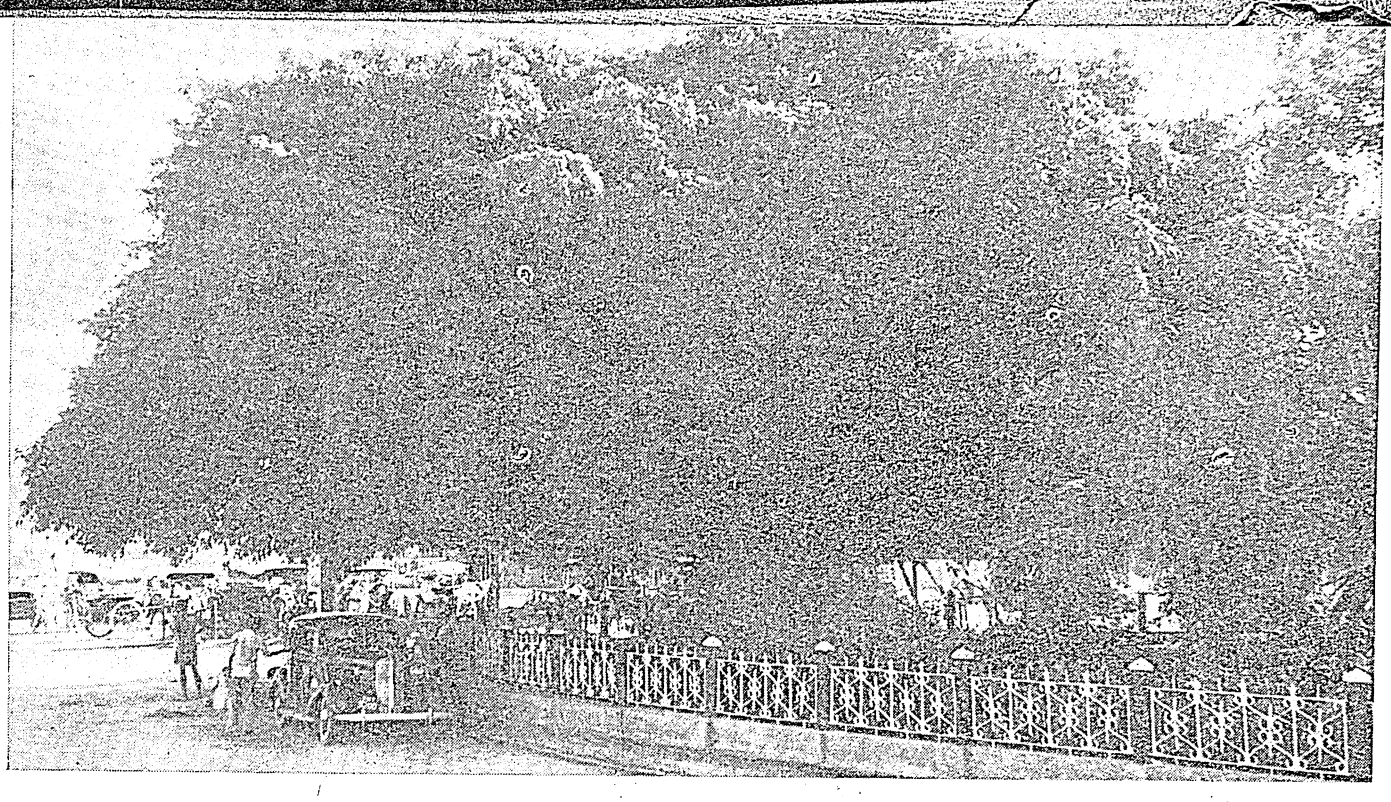
HOW TO PROPAGATE

The seed obtained from crushed and dried fruit is much too tiny to germinate in the ground without a lot of care; it often germinates in tree tops where it is lodged by birds.

Seedlings are best raised in boxes, using fine garden soil admixed with powdered charcoal. Young seedlings should be kept in shade, protected from intense exposure to the sun; they can stand a lot of shade.

A *pakar* avenue in Bareilly





The giant *pakar* tree near the Bareilly Railway Station

They must be protected from severe frost by covering with capes made out of grass. The *pakar* cannot stand severe drought for long. Young shoots and seedlings are apt to be browsed.

Pakar basket-transplants strike well. Stumps or cuttings made out of seedlings with shoot two inches and root nine inches put out at the break of the monsoon yield good results. The seedlings should be as thick as one's thumb, at the base.

ON ROADSIDES

Along roadsides, the *pakar* is generally propagated by just sticking in branches which sprout at the break of the monsoon. These branch cuttings should be five to six feet in length and cut out from new shoots with mature wood. In Uttar Pradesh, a number of avenues have been raised in this manner. The stems of these cuttings assume cute and attractive forms and support shady crowns; they are not as straight as stems of trees raised from seedlings.

In the *sal* areas of the Uttar Pradesh terai, the *pakar* was systematically planted to provide protection to *sal* coppice annually killed back by frost. For a rapid establishment of a roadside avenue, there are few trees that can equal *pakar* branch cuttings. In camping grounds, the *pakar* is raised from seedling transplants raised in baskets in nurseries.

Except for providing shade and shelter and leaf fodder for goats, buffaloes and elephants, the *pakar* yields nothing of value. Its timber is moderately hard. It is no good even as firewood. Its bark yields a fibre used for making ropes.

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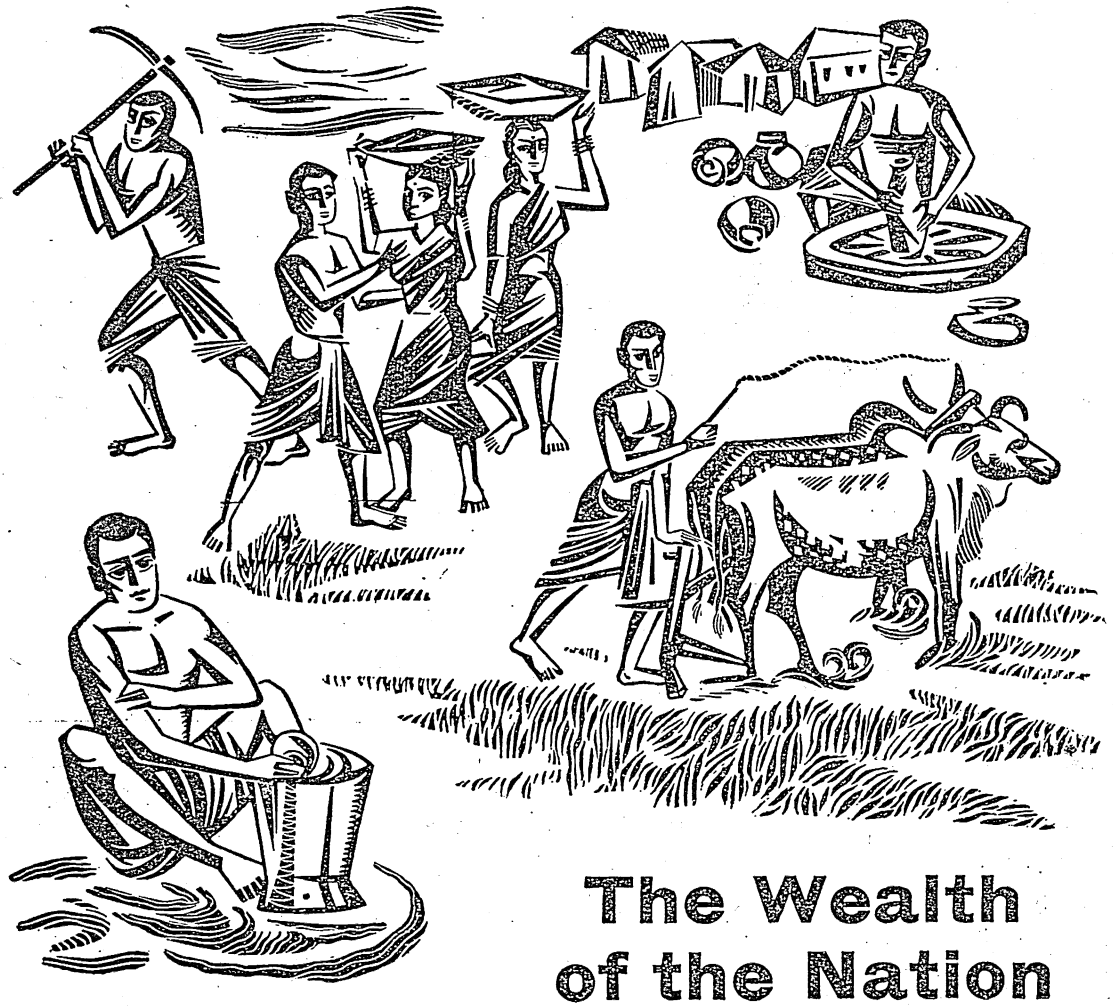
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BOMBAY-14



The Wealth of the Nation

Tough, hard-working hands — hands that plough and sow and reap — farm-workers' hands: their skill and their toil produce the wealth of the nation. How vital therefore to protect their health.

And yet, because a farm-worker cannot avoid dirt while working, he daily runs the risk of disease and ill-health through infection from the germs that all dirt contains. For this reason alone it is important that self-help programmes in our villages should always point out the value of *self-help* in personal health and hygiene.

The villager who learns for himself and teaches his family the hygienic necessity of washing regularly with a good soap — and particularly with LIFEBUOY SOAP because it washes away the germs in dirt — is doing very much more than acquiring a healthy habit: he is helping to protect the nation's health and wealth.

LIFEBUOY SOAP



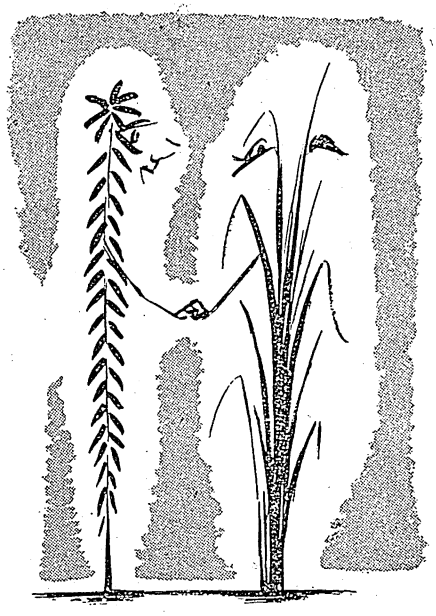
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WHAT'S NEW IN FARMING

BETTER WHEAT YIELDS

WHEAT yields shot up by over 50 per cent when a crop of irrigated wheat was green manured with sannhemp in a recent experiment at the Agricultural Research Station at Niphad in Nasik district of Bombay State.



The sannhemp was sown in June at 60 pounds to the acre. The crop gave 27,000 pounds of green matter for burying in the soil in August. The wheat crop was sown in November.

Farmers in the area are being advised to sow sannhemp during the early showers of June and also plough the same in early, as otherwise the crop would be too woody and will not decay in time.

Earlier experiments in the State had shown that burying a crop of sannhemp as green manure gave better results than the application of 30 cartloads of cattle manure per acre.

SWEET POTATO

EXPERIMENTS in Bombay State show that the top portions of the sweet potato vine are better than the middle or bottom ones for planting, as these give better yields.

Hence, the tender shoots and the woody basal portions of the vines selected for planting should be rejected.

Only well-matured, disease-free vines should be selected for cuttings. The cuttings should be nine to ten inches long.

After clipping the leaves, the cuttings should be dipped for eight to ten minutes in a solution of a pound of 50 per cent wettable DDT in 25 gallons of water. This treatment will keep the cuttings free from fungus diseases like black stem rot and pests like sweet potato vine borer and weevil.

NEW PUNJAB COTTONS

As a result of intensive research work conducted in the Punjab, two new strains of long staple cotton have recently been evolved.

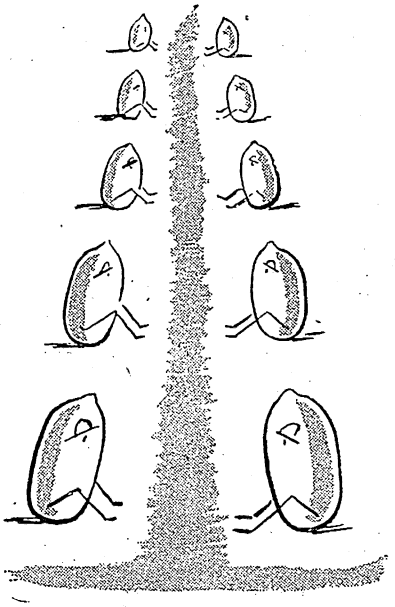
The two new strains are *LL.53* and *LL.54*. *LL.53* has a mean fibre length of 1.10 inches and *LL.54* 1.07 inches. These strains also have other desirable economic characters like greater yield and higher ginning percentage. Trials have shown that the two strains are better than *320 F* cotton which is the existing strain in the Punjab.

District trials with the new strains have given very encouraging results, bringing an average cash return of Rs. 625 and Rs. 686, respectively, per acre, as against Rs. 608 from *320 F*.

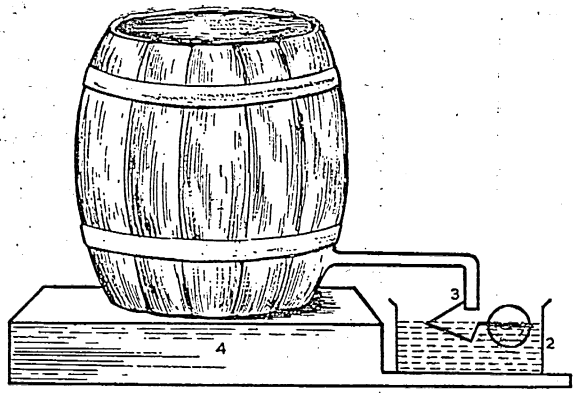
Extensive trials with the two strains are now being planned all over the State.

SPACING IN GROUNDNUT

SPACING trials with groundnut in Bihar have shown that the crop gives best results when spaced six inches between plants and a foot between rows.



In the State, farmers sow groundnut in rows two feet apart with a distance of nearly one foot between plants. The variety cultivated is the spreading one. Farmers also practise ridging when the plants have grown six to nine inches high. But the trials show that ridging had no special advantage from the yield point of view.



An automatic range waterer made out of a wooden barrel—(1) wooden barrel, (2) watering pan, (3) automatic float and (4) platform

POULTRY BIRDS NEED

YOU may not have realized it, but water is as important to poultry birds as food is, or even more.

Two-thirds of the egg is water. A dozen good-sized eggs contain over a pint of water, and water makes up 55 to about 78 per cent of the weight of the chicken, the young birds having a greater water-content than the adults.

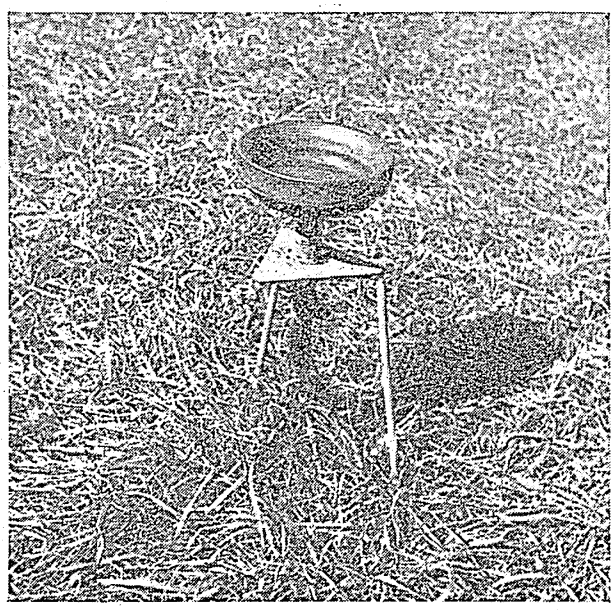
Of the six constituents of feeds, water comes first, then follow proteins, fat, carbohydrates, salts and vitamins.

A bird can live for a longer period without food than without water. A bird dies of thirst as soon as it loses water to an extent of ten per cent of its body weight. If the supply of water is limited, the egg yield goes down considerably and if this continues the egg yield may completely stop. If you take away all the drinking water from a bird it will stop egg production in the course of 48 to 60 hours.

An adult bird consumes from six to eight ounces of water daily. The quantity required is more in summer than in winter. Birds in lay consume more water than non-layers do.

Feeding also plays an important part in the quantity of water required by the birds. A bird given grain and mash alone needs more water than the one receiving succulent greens. Similarly, the composition of the ration also influences the total water consumed by the bird. The one on a high protein diet consumes more water than the one receiving less of proteins. A slight increase in the quantity of common salt in the ration will also increase water consumption.

One of the commonly used automatic waterers used on ranges in Canada and the U.S.A.



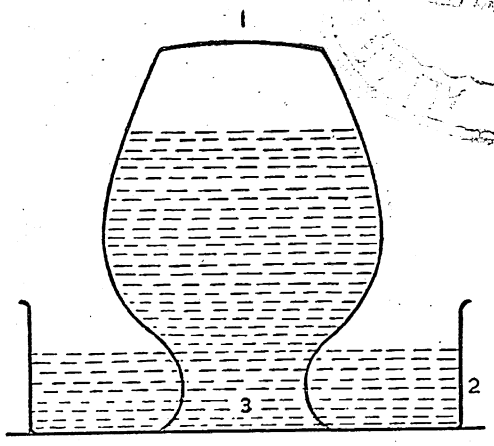
A certain quantity of water is produced when the food is burnt up in the bird's body. The grains and other dry feeds given to the birds also contain some water in them. But the total supply of water from these sources is almost insignificant. A bird, therefore, has to depend, for its water requirements entirely on water in the fluid form. Hence, to keep the birds in good health and performance, their requirements of water should be met in full.

PECULIAR DRINKING HABITS

Birds are peculiar in their drinking habits. They take small amounts of water at a time and cannot remain for long periods without it. When dry mash is fed, they take sips from time to time while feeding. Unlike cattle and buffaloes which require to be watered twice or thrice a day, poultry birds need a constant supply of drinking water all the 24 hours, because they cannot store the water for long in their bodies.

LIBRARY

WATER ALL THE TIME



An inverted glass jar type waterer—(1) inverted glass jar, (2) shallow pan and (3) water

by

Krishan Gopal Mahindru

A poultry bird is very much susceptible to heat prostration and will not make any effort to drink water if it is not easily accessible. It will thus die of thirst.

A plentiful supply of clean, wholesome and cool water will very much reduce deaths in the pens during the hot weather and will prevent the summer drop in egg yield.

Poultry birds, of course, prefer fresh, cool and clean water. It should neither be too hot nor too cold. Only then will they take in the maximum quantity of it. With the right amount of water taken in, they will consume the needed quantity of food also. Thus, they will maintain excellent health, growth and performance.

AUTOMATIC WATERER

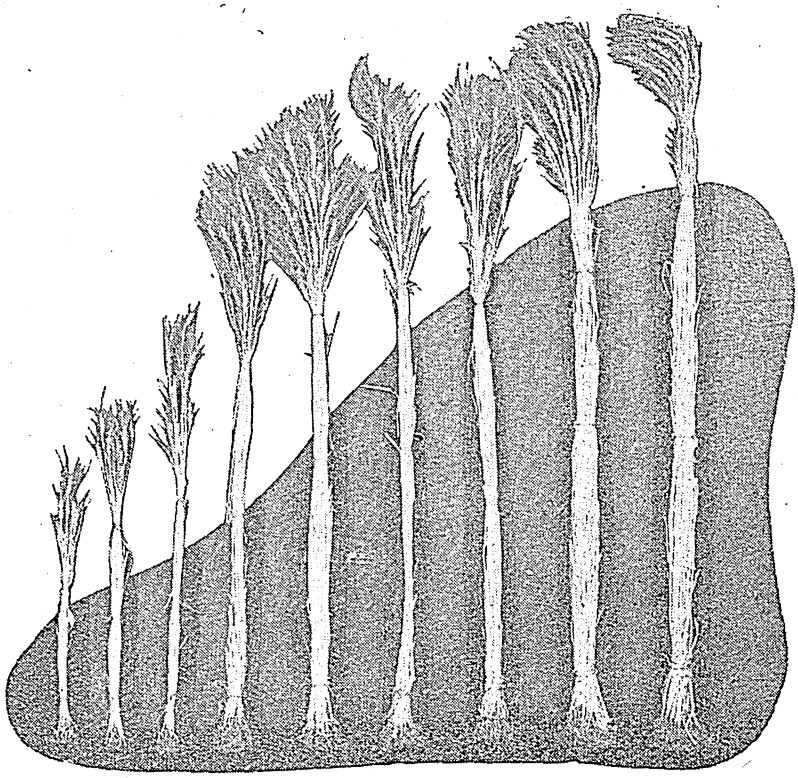
In the hot weather, keep water before the birds at all times. Keep the water in earthen pots on the floor or in such other places as are easily accessible to the birds for 24 hours. Water keeps cool and fresh in earthen pots. It is best to keep the water supply near the feeder. Where a regular water supply is available, automatic waterers may be used on the range or in the pens. The water pipes should be laid deep in the ground to avoid the extremes of weather affecting it. Where it is not possible to lay water pipes, an efficient and practical type of range waterer can be made from a wooden barrel mounted on a short platform with a watering pan. An automatic float should be fixed so that the flow of water from barrel to the pan may be regulated.

Providing watering pans for young chickens needs special attention. A very cheap and effective method consists in taking a shallow earthen vessel filled with water and pebbles of two to three inches in diameter. This will prevent chickens from drowning themselves in the pan, but give them free access to the water. Another effective appliance will be a shallow pan with an inverted glass jar or cylinder filled with water. Here, chickens receive a regulated and constant supply of clean water and escape being drowned. Whatever the source of water and whatever the system of watering, you should make sure that the birds get a constant supply of clean, wholesome, fresh and good water all the 24 hours.

Birds do their best if you do your best to look after them. Water being so vital for the birds, its supply to them needs more attention than even food.

Another type of automatic waterer commonly used in Canada and the U.S.A.





Under different treatments wheat plants look different. (*From left to right*) **no fertilizer, P_2O, P_4O, N_2O, N_4O, N_2O+P_2O, N_2O+P_4O, N_4O+P_2O and N_4O+P_4O**

Bigger Harvests With Fertilizer Use

by

V. T. Motwani
Agricultural Research Farm
Halvad (Saurashtra)

USE of fertilizers has shown the way to better wheat yields to farmers in Halvad taluka of Zalawad district in Saurashtra (Bombay State).

In 1953-54, these farmers for the first time got the benefit of canal water irrigation because of the Brahamani Dam. Instead of being happy, they were rather puzzled as to how best to utilize the water for increasing their wheat yields which were as low as 300 pounds per acre on the average.

An analysis of the soil of the area earlier had proved it very low in nitrogen and phosphoric acid—the two important nutrients. Farmers were aware that this could be rectified by application of good manures. But they were handicapped in that. There were only 70,000 head of cattle for a gross sown area of two lakh acres. No more than two cartloads of cattle manure would, therefore, be available for application to an acre of land. Their salvation, therefore, lay in fertilizers.

But, how much of fertilizers to get an economic yield? This, the Agricultural Research Farm at Halvad found out.

FERTILIZER TRIALS

At the Farm, trials were conducted with 20 pounds of nitrogen ($1\frac{1}{4}$ maunds of ammonium sulphate), 40 pounds of nitrogen ($2\frac{1}{2}$ maunds of ammonium sulphate), 20 pounds of phosphoric acid ($1\frac{1}{2}$ maunds of single superphosphate) and 40 pounds of phosphoric acid (three maunds of single superphosphate) when given alone and in different combinations to the wheat crop. Plots with no fertilizer applied were kept as control for comparison.

Sulphate of ammonia was applied broadcast. Superphosphate was incorporated into the soil with a five-coulter drill run in both directions, before the second soaking was done. This helped in a proper mixing and a uniform distribution of the two fertilizers.

Trials in three successive years showed that nitrogen and phosphate helped increase the height of plants, number of tillers, ear length, number of grains per ear and yield of grain per acre.

GOOD RESPONSE

Nitrogen alone showed a good effect on the wheat crop as against the per-acre yield of 406 pounds with no fertilizer. With 20 pounds of nitrogen the per-acre

yield was 632 pounds of grain (11.3 pounds of grain per pound of nitrogen), and with 40 pounds of nitrogen, 823 pounds of grain (10.4 pounds of grain per pound of nitrogen).

Similarly, the response to phosphoric acid was also very clear as against 406 pounds of grain per acre with no fertilizer. With 20 pounds of phosphoric acid the per-acre yield was 419 pounds of grain (0.65 pound of grain per pound of phosphoric acid) and with 40 pounds of phosphoric acid 582 pounds of grain (4.4 pounds of grain per pound of phosphoric acid).

With nitrogen and phosphorus combined, the yield was still better as is seen below.

	Doses of nitrogen-phosphorus				
	0	N_2O P_2O	N_2O P_4O	N_4O P_2O	N_4O P_4O
Average of three years	406	1,117	1,070	1,265	1,438
Response per pound of NP	—	17.8	11.1	14.3	12.9

It was thus seen that nitrogen alone was more effective than phosphorus alone, and that a combination of both was more effective than an individual fertilizer. Application of 40 pounds of nitrogen and 20 pounds of phosphoric acid gave a better yield per pound of nutrients than when 40 pounds of nitrogen and 40 pounds of phosphoric acid were used.

DEMONSTRATIONS ARRANGED

In the following years, simple demonstration plots were arranged at the subsidized farms at Karsangadh and Fulgram in Zalawad district. Various fertilizer treatments gave increased yields ranging from about 24 per cent up to 77 per cent.

The information that fertilizers increased the grain yield of wheat will not by itself satisfy the farmer. Naturally, he would like to know how far it would be economical. Hence, he has to be told how much he would actually stand to gain by taking the cost of the fertilizer and the extra grain yield into consideration. The cost of each treatment and the net profit or loss per acre resulting thereby are seen in the Table in the next column.

It is seen that with a greater dose of single nutrients, profits increase proportionately. However, applying phosphorus alone is not as profitable as applying nitrogen alone. Even a single dose of nitrogen is very much better than a double dose of phosphorus from the profit point of view.

Treatment	*Name and quantity of fertilizer applied per acre*	*Cost of fertilizer +fertilization*	*Increase in yield due to addition of fertilizer in pounds per acre*	*Extra income due to higher yield (Rs. 10 per 40 pounds of grain)*	*Net profit or loss per acre*
		Rs. nP.		*Rs. nP.*	*Rs. nP.*
No fertilizer	—	—	—	—	—
P_2O	125 pounds of superphosphate	17.94	12.7	3.25	(—)14.69
P_4O	250 pounds of superphosphate	31.88	175.7	44.00	12.12
N_2O	100 pounds of sulphate of ammonia	23.67	226.0	56.50	32.83
N_4O	200 pounds of sulphate of ammonia	41.09	417.0	104.25	63.16
N_2O P_2O	100 pounds of sulphate of ammonia +125 pounds of superphosphate	37.61	710.7	177.75	140.14
N_2O P_4O	100 pounds of sulphate of ammonia +250 pounds of superphosphate	51.55	664.0	166.00	114.45
N_4O P_2O	200 pounds of sulphate of ammonia +125 pounds of superphosphate	55.03	858.7	214.75	159.72
N_4O P_4O	200 pounds of sulphate of ammonia +250 pounds of superphosphate	68.97	1,032.3	258.00	189.03

NITROGEN-PHOSPHORUS COMBINATION

A combination of nitrogen and phosphorus even in a single dose brings in a 100 per cent more of profit than when a double dose of a single fertilizer is applied.

It is also seen that where only nitrogen was in double dose, it gave better profit than with the combination where only phosphorus was of double dose. Double doses of both the nutrients in combination gave Rs. 49 per acre more as profit than the single doses of the nutrients in combination.

There are other benefits also from fertilizer application. Fertilized plots yield plumper seeds. Such seeds fetch a better price in the market. Besides, the plumper the seed the more vigorous the plant and the higher the yield; also a smaller quantity of seed needed for sowing.

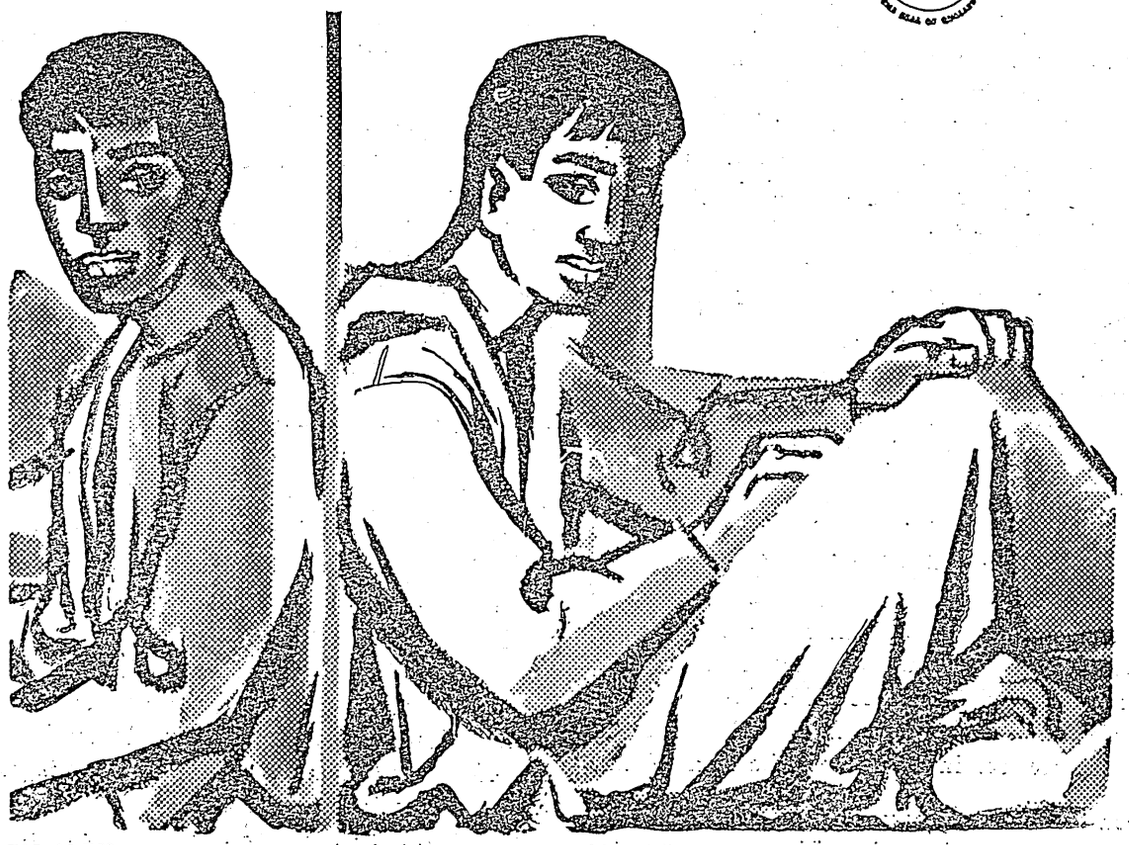
They live next-door to each other ...years apart !

Next-door neighbours may look and dress alike; yet each is an individual . . . sometimes, years apart in ideas and outlook.

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EACH FIELD CAN GROW ITS OWN MANURE

by

M. S. Sivaraman

Adviser, Programme Administration

Planning Commission

New Delhi

SINCE the beginning of the Second World War, the food position in India has been chronically unsatisfactory. Many steps, like extension of the irrigated area, larger use of chemical fertilizers and adoption of improved methods of cultivation, have been taken to increase food prodution. As a result, there has been some increase in total production, but this has not been sufficient to meet the country's growing requirements due to increase in population and a change in the food habits of certain sections.

RISE IN POPULATION

During the last 20 years, the population of the country has gone up by over 70 million. At the same time, there has been a rapid rise of over 30 millions in the urban population and this has increased the demand for wheat and rice without increasing appreciably the supply of millets in the market. Even after several years of efforts through various approaches, wheat and rice have to be imported from other countries to maintain a low standard of nutrition with the main emphasis on cheaper forms of food energy from cereals. The cultivated area has remained nearly the same and it is not likely that more area will be available for profitable cultivation.

So far, we have not succeeded in producing our entire needs of foodgrains. How then can we grow all our requirements of grains and further develop more of protective foods like milk, eggs, meat which require a larger surface area than cereals for producing the same amount of food energy ? These are difficult problems, but a solution can be found if we examine the fundamentals of the problem and take stock of the basic factors affecting crop yields to see in what direction we should reorient our efforts to secure better results.

NITROGEN DEFICIENCY

In the final analysis, agricultural production depends upon the soil and the presence in the soil of the more important plant nutrients like potash, phosphates, lime and nitrogen. Indian soils are generally rich in potash and contain adequate quantities of phosphates, but deficiency of lime is found in some of the acid and leached soils of the heavy rainfall zones. Nitrogen is deficient in all types of soils and in nearly all parts of the country as the result of intense biological activity that takes place in tropical soils.

At the present low average level of agricultural production, the major crops in India remove annually over 3.8 million tons of nitrogen from the land, but the quantity of manure which is available for application to crops by way of farmyard manure, composts, green manures, oilcakes and inorganic fertilizers is less than a million tons of nitrogen in a year. The balance of nitrogen is made available through the natural recuperative processes that take place in the soil and outside and through the uncollected waste products of plant and animal life.

As nitrogen is deficient all over the country, agricultural yield has become stablized at a low level which is determined by the meagre supply of this essential plant

nutrient and it must be emphasized that no effort to improve crop production will succeed if it ingores this fundamental fact. For, agricultural output is ultimately determined by the quantum of that plant growth factor which is present in relatively least quantities. The problem of improving agricultural production in India, therefore, resolves itself for the present into the problem of increasing soil nitrogen.

In practice, there are many difficulties in solving it. The common source of soil nitrogen is farmyard manure, which is limited in supply, as a large portion of cattle dung is burnt for want of a cheaper fuel. Nitrogenous fertilizers will help irrigated areas, but the quantity available in the country is hardly sufficient for a fourth of the present irrigated area of about 60 million acres. Moreover, the use of fertilizers is risky in areas which depend entirely on rainfall unless the rains are well distributed, and that is rarely the case. Oilcake is an important source of concentrated organic nitrogen, but its supply can be expanded only slightly and the cost of manuring cereal crops with this is prohibitive.

GREEN MANURES

Of the various sources of nitrogen, green manures and rural composts have distinct possibilities of rapid extension in spite of the meagre resources available to the cultivator. All over India, agricultural research workers have found that green manure has a beneficial effect on cereal crops—the increase in the yield of paddy and wheat by applying green manure being 20 to 40 per cent.

Still, the practice of green manuring has not advanced rapidly and out of nearly one hundred million acres which can be green manured, hardly ten per cent is green manured at present. The chief reason for the slow progress in the development of green manuring appears to be the inadequate supply of green manure seeds. The severe summer and winter conditions in north India restrict a large scale development of green manure seeds. It is only in the rainy season that good seeds can be produced in the northern states, but such cultivation cannot compensate the cultivator for loss of other crops which he could have grown. In a few places, small quantities of sannhemp (*Crotalaria juncea*) are raised as a fibre crop or as a mixed crop with millets and pulses. In the southern states, where the summer temperature is not so high and the winter is mild, wild indigo (*Tephrosia purpuria*) and *Pillipesara* (*Phaseolus trilobus*) are raised during summer as a green manure crop after the harvest of paddy, but the production of seeds is uncertain as occasional heavy rains in the summer interfere wih the setting of seeds.

Paddy occupies over 25 per cent of the cultivated area in India, and among the cereal crops it is found to respond the most to green manure. A suitable green manure for paddy should produce seeds when grown on the swampy paddy soils as in many paddy areas there will be very little of dry land available for raising green manure seeds. Over 50 million acres (two-thirds of the paddy area) are not irrigated and the incidence of rain is generally erratic at the beginning of the monsoon. The green manure plant should, therefore, be able to pull through droughty conditions in the early stages and also water-logging in the later stages of its growth. It should be fast growing and capable of yielding 4,000 to 8,000 pounds of green manure per acre in four to six weeks before the main crop in July-August within the time required for raising paddy seedlings for transplantation. It should be of a cosmopolitan type which will flourish on varied types of soils including moderately saline and alkaline conditions and above all it should be relatively resistant to pests and diseases.

RURAL COMPOST

In the case of rural composts, production is limited by the available plant wastes suitable for composting, like leaves and twigs. But the bulk of the crops produced in the country is used as food for men or feed for cattle or both, and very little material is left over for composting. If we have to develop more of compost for use on over 250 million acres of rainfed land, we have necessarily to produce the extra plant materials which can be composted on the cultivated lands without interfering with normal cultivation.

This may be possible by large scale planting of quick-growing perennial shrubs which will not be eaten by goats or cattle—the choice of shrubs being determined by its adaptability to varied conditions of soil and climate. Such shrubs should withstand frequent lopping and at the same time produce large quantities of leaves, should be resistant to drought and thrive under water-logged conditions, and above all should have no adverse root effect on the adjoining crops.

At first sight the difficulties mentioned above appear to be insurmountable. The essential requisites for desirable green manure plants and border shrubs would make it appear extremely difficult to find such plants. But unless suitable plants are found, it will not be easy to get an inexpensive solution to the problem of nitrogen deficiency of soils.

I studied this problem for several years as a district officer and some of my observations on green manure plants and shrubs have helped find a solution. For instance, stray self-sown *Sesbania speciosa* seedlings were found to grow on the beds of irrigation channels even after the channels were full—the plants developed adventitious roots that floated in water. Thus *Sesbania speciosa*, unlike sannhemp, *Pilli pesara* or wild indigo can be expected to grow in the wet conditions of paddy fields, and if a small number of these plants raised on the borders of a field can produce the seed required for growing green manure on that field then we should have found a solution to the problem of seed production.

QUICK-GROWING SHRUBS

Ipomoea carnea is a quick-growing ornamental shrub which is sometimes raised as a hedge plant as it is not readily browsed by goats or cattle. It has no thorns and can withstand severe lopping every two months and thrive under extreme conditions of drought and swamp. I have noticed *Ipomoea carnea* growing in the light, red soils of Visakhapattanam, heavy black soils of Bellary, in the deltas and in the laterite soils of Malabar under widely different conditions.

Glyricidia is cultivated as a shade plant in the tea estates in low elevations in the heavy rainfall areas of Wynad and it also grows well in areas of meagre rainfall like Ananthapur and Bellary. It withstands severe lopping and though it does not relish water-logged conditions it thrives on the bunds of paddy fields. The leaves of Glyricidia are browsed by cattle and goats but the plant

grows so fast that the leaves will be beyond the reach of cattle in six months if it is protected during that period. As cattle are not usually allowed to wander on cultivated fields during six to eight months in a year when the crops are on the ground it should be possible to grow Glyricidia even on unenclosed lands. Glyricidia can be raised from cuttings; by planting just before the rainy season six to eight feet long cuttings from trees grown in protected areas, the problem of cattle trespass in the early stages of its growth can be solved.

In 1951, I noticed a few shrubs of *Indigofera teysmanni* in the Peradenya Botanical Station in Ceylon and this shrub was found to be useful like Glyricidia. I obtained two dozen seeds and introduced the plant in some of the state farms in Madras. Each shrub produced about two pounds of seeds after a year and it was possible to plant over 1,00,000 *Indigofera teysmanni* shrubs in one research station alone in 1953 as an ocular demonstration of the possibilities of mass development of plant wastes within a very short time.

Sesbania aegyptiaca is another quick-growing perennial shrub found all over India, which can be lopped frequently. It produces abundant supply of seeds and leaves. In Chitoor and Ananthapur districts, there are many instances of good cultivators who produce their entire requirements of organic manure from even small holdings by growing *Pongamia glabra* on the borders of fields. The leaves of this tree are used as green manure for the paddy fields or composted for use on dry fields. The crop yields of these cultivators are four to five times the average for India, and the crops are not affected by the adjacent tree growth, contrary to general notions of adverse shade or root effect of trees. If some cultivators can produce their requirements of organic manure in this way and improve upon the crop yields, others also should be able to do likewise, provided the right types of plants that will suit different areas are selected and used.

As Director of Agriculture of the composite, and later on of the residuary, Madras State in 1947-48 and 1951-55, I was able to initiate and successfully follow up my observations and ideas about development of green manures and plant wastes in the different soil and climatic zones of the State. Many of the State Agricultural Research Stations in Madras were then short of manures and this was made good by purchase of town-composts, farmyard manure or oilcakes.

DEVELOPING LOCAL RESOURCES

As a first step, this practice was stopped; for, a fundamental problem like overall shortage of soil nitrogen in the country cannot be solved merely by a redistribution of the available quantity from one field to another. The officers-in-charge of these state farms were directed to develop local manurial resources to a level of self-sufficiency by raising green manure and by planting quick-growing shrubs.

I suggested the possibility of producing green manure seeds by growing *Sesbania specisoa* on the bunds of paddy fields, on the sides of the bunds and in the field itself by transplanting seedlings. The Farm Superintendents were also required to grow quick-growing shrubs like Glyricidia, *Sesbania aegyptiaca*, *Indigofera teysmanni*, *Ipomoea carnea*, *Calotropis gigantea* and *Adathoda vasica*. A detailed study was made of the production of green manure seeds by planting *Sesbania speciosa* at different intervals of time and distance. The quantity of leaves produced by the shrubs at each lopping, the ability of the plants to stand frequent lopping, the optimum intervals for lopping and the quantity of manure produced in a year were also observed.

It was found that by growing *Sesbania speciosa* two to three feet apart on the bunds or in the field, it is possible to produce in a one-acre field, the green manure seeds sufficient for raising green manure on two to three acres. *Dhaincha* (*Sesbania aculeata*) was found to be equally adapted for certain places like the costal areas of the Godaveri districts. The planting of such green manure plants or perennial shrubs did not have any adverse effect on the crops in the field. By raising *Sesbania speciosa* two to three inches apart on the fields along with the first crop of paddy it was possible to produce sufficient green manure for the second crop which in districts like Tanjore and Trichinopoly seldom received any manure. Among the plants studied, Glyricidia, *Ipomoea carnea*, *Indiogofera teysmanni* and *Sesbania aegyptiaca* were found to grow under widely different conditions and provide very large quantities of green leaves from frequent loppings.

REMARKABLE RESULTS

The application of the result of these experiments proved to be remarkable. All the State Agricultural Research, Experimental and Demonstration Farms in Madras State became self-sufficient in the matter of organic manure within three to four years. Every farm became virtually a factory for producing its own manure without in any way affecting its normal cropping pattern. For instance, the production of green manure in the Aduthurai Rice Research Station—a 50-acre farm in the Cauvery delta—increased from 20 tons in 1948-49 to 379 tons in 1952-53 and the total annual output of paddy from the farm rose from 1.07 lakh of pounds in 1948-49 to 2.33 lakh pounds in 1952-53. The average acre-yield of paddy for the farm was raised from 1,860 pounds to 3,085 pounds.

At the Kovilpatti Agricultural Research Station with a 100-acre dry farm of shallow black soil in an area of about 25 inches rainfall, the production of composts from loppings of perennial shrubs like *Ipomoea carnea* and Glyricidia was 346 tons in the third year of planting the shrubs, a production of $3\frac{1}{2}$ tons of the manure per acre, which is normally sufficient for dry crops.

At the Palur Research Station in the tract of red sandy loam with 40 inches of rainfall, the production of manure rose from 0.5 ton to 71 tons in three years. At the Research Station at Taliparamba in a lateritic area on the West Coast with over 100 inches rainfall, the production increased from 40 tons to 106 tons of organic manure.

At the Pattambi Rice Research Station in Malabar with about 60 inches rainfall there was mass production of green leaves by planting over 1,00,000 shrubs of *Indigofera teysmanni* in 1953, and when these leaves came to be used as manure from the next year, there was a steady increase in the yield of paddy from year to year and in three years, the yield went up by 60 per cent over an average yield of about 1,400 pounds per acre in 1953.

MADRAS EXPERIENCE

In Madras State, it can now be confidently asserted that on every holding, irrespective of size, it is possible to produce the complete requirements of organic

manure by way of composts for use on dry and garden lands, and green manure for use on irrigated lands by border planting of green manure shrubs—perennial or annual—without in any way affecting the usual crops.

It may be mentioned that among the important rice-producing states in India where production of rice has increased in the First Five Year Plan period, the highest increase of over 50 per cent has been in Madras State from 2 million tons of rice in 1951-52 to 3.1 million tons in 1955-56. The Andhra State, some portions of which were part of Madras till October 1953, came next with a 35 per cent increase.

Among the various measures adopted to achieve this result, green manures played a significant part in these two states. The experience of these states, where the average acre-yields are higher than in the rest of India, can be repeated with even more striking results in areas where the present yields are low.

The climatic and soil conditions of the farms of the Research Stations in Madras are very diverse and the results obtained there will hold equally well to the different parts of India where conditions are not different. Plants like *Ipomoea carnea* and *Sesbania aegyptiaca* thrive in all parts of India. Glyricidia and *Indigofera teysmanni* grow well in most places. All these shrubs and suitable green manure plants can be developed to cover every field in every village in the country in two to three years from small nucleus materials. The border planting does not require any expenditure of money and all that is required is an earnest effort to raise the shrubs on a predetermined plan.

All over the country, there is urgent need to realize that the first rational step that has to be taken to build up the nutritional standard is to increase agricultural production to a very high level so that more cereals are produced on less area and the area thus made available is diverted for the production of protective foods like milk, eggs, meat, fruits and vegetables. No permanent improvement in agricultural production is possible without any systematic attempt to solve the vital problem of nitrogen deficiency. With a proper organization, every cultivator can be convinced that with some extra effort and very little expenditure of money he can grow every year the organic manure required for his fields and thereby not only improve the yields but also reduce the cost of cultivation and lay the foundation for a lasting improvement in agricultural production.

ERRONEOUS BELIEF

In some of the northern states there is a belief that 20,000 to 30,000 pounds of green manure should be applied per acre a few weeks in advance of the cultivation of the main crop and as such large quantities cannot be produced without missing the proper season for raising the main crop. There is a widespread impression that green manuring is not a feasible measure that can be generally adopted.

This is clearly erroneous. The optimum dose of green manure for paddy varies from 2,000 to 8,000 pounds per acre and this quantity can be produced in four to six weeks by using 20 to 30 pounds of seeds per acre. If two ounces of seed of *dhaincha* or *Sesbania speciosa* costing five naye Payse are dibbled on the bunds of the plots in a one-acre field along with the main *kharif* crop in July, it is possible to produce from 60 to 160 pounds of seed before December in unirrigated areas of 30 inches and over of rainfall.

Seedlings of *dhaincha* and *Sesbania speciosa* can also be raised along with paddy seedlings and transplanted in the field itself along the margins of the bund after the transplantation of paddy when the plants are eight to 12 inches high. In Tanjore district, some cultivators transplant the green manure seedlings in the field about three feet away from the bunds so that the plants may not be damaged by stray cattle.

IN RAIN-FED AREAS

Where the rainfall is below 30 inches, sannhemp and cluster beans thrive well and the seeds of these may also be developed in the same manner. Sannhemp does not flourish where there is stagnation of water, but it can be raised on the high level bunds of fields in places where the rainfall is not very heavy. In areas where the rain-fed crops—*jowar* or pulses—are raised, sannhemp, cluster beans, *dhaincha* or *Sesbania speciosa* can also be sown as a mixed crop for producing seeds. About 20 to 30 pounds of *dhaincha* or *Sesbania speciosa* or 40 to 60 pounds of sannhemp may be sown with the summer showers from April to June or with any available irrigation for the production of green manure for the next crop of transplanted paddy.

In places where paddy is sown broadcast as in many parts of Orissa, about 15 pounds of *dhaincha* or *Sesbania speciosa* may be sown along with paddy, and after about a month when the paddy crop is thinned out by ploughing, the green manure plants are pulled out and trampled into the field. This method of green manuring has helped to increase the yield of paddy by 12 per cent according to experiments done at the Cuttack Rice Research Station.

ON FALLOW LANDS

In many parts of Uttar Pradesh, the wheat fields are kept fallow during the rainy season from July to September in which case a green manure crop of sannhemp, *dhaincha* or *Sesbania speciosa* can be easily raised and ploughed into the field by the middle of August. Short-duration pulse crops like green gram, black gram, horse gram or cluster beans can also be cultivated with the rains and ploughed in time. In some of the irrigated areas where a cereal like maize is raised before wheat, a green manure crop can be grown along with the *kharif* cereal in alternate lines so that it can be incorporated into the soil immediately after the harvest of the *kharif* cereal.

In areas with a rainfall of 20 to 30 inches and even in places where the rainfall though over thirty inches often fails after the first half of September, a systematic attempt has to be made to grow perennial shrubs like *Ipomoea carnea*, *Sesbania aegyptiaca*, Glyricidia and *Indigofera teysmanni* to produce the green leaves on the borders of fields which have no irrigation facilities. The leaves can be lopped from time to time and composted in a corner of the field. For this purpose, a compost pit of eight feet × six feet × three feet in any field is sufficient to produce the basic requirements of manure for an acre and two or three of such pits may be filled in with loppings so that larger quantities of manure may be available for application.

In actual practice, the measures which the cultivator has to adopt are simple and inexpensive, and in order to emphasize these every state agricultural farm should produce its entire needs of organic manure by way of composts from the plants grown in the farm or of green manure raised from seeds produced in the farm. At present, some of the Government farms purchase farmyard manure, composts or press mud from outside areas in order to make good the deficiency of manures available in the farm and sometimes even green manure seeds are purchased in the market. This has a damaging effect on the propaganda for development of local manurial resources, for no cultivator will take the advice of the Agricultural Officers seriously in this respect if the state farms do not practise themselves what they ask the farmers to do. It should, therefore, be made obligatory on the part of the Government farms to produce within two to three years their full requirements of organic manure.

MASS CAMPAIGNS

At the same time, mass campaigns should be organized to explain the feasibility of producing the required organic manures on every field. The enthusiasm of the cultivators has to be created and kept up by systematic publicity and propaganda in every village and in every place where villagers congregate in large numbers like fairs, festivals, etc.

The Village Level Worker has to play a leading part in this. He has to organize the publicity meetings and approach individual cultivators and induce them to grow the green manure plants for producing seeds and the shrubs for producing the organic wastes required for composting. He would supply packets of seeds of the nucleus plant materials for mass planting of shrubs. He has to enlist the full co-operation of the village panchayat, the village co-operative organization, school teachers, village officials and leading villagers. Everyone who has any local influence should be urged to distribute the packets and see to it that the green manure plants are grown on the margins of fields and the perennial shrubs are raised wherever possible. A definite programme should be drawn up for producing the manure required for all fields in any village within two years. A list of green manure plants suitable for the different types of fields in the village should be prepared by the Agricultural Department, the requirements of seeds and cuttings estimated and timely steps taken to ensure that the seeds and cuttings are in the cultivator's hands in time.

CUMULATIVE INCREASE

Experience in Madras shows that the increase in the yield of paddy by the use of green manures is cumulative and there is a steady increase from year to year until an average of about 2,500 to 3,000 pounds of paddy per acre is obtained as against the present all-India average of about 1,100 pounds per acre. Further increase can be secured by the combined use of organic manures and fertilizers, both nitrogenous and phosphatic. Apart from increasing the yields the incorporation of green manure or orgaic manure help increase the capacity of the soil to retain more moisture under rainfed conditions. Experimental work done in Bihar shows that green manuring not only increases the yield of paddy but also lowers its water requirements by ten per cent. Under similar conditions of drought and in similar

(*Contd. on page 39*)

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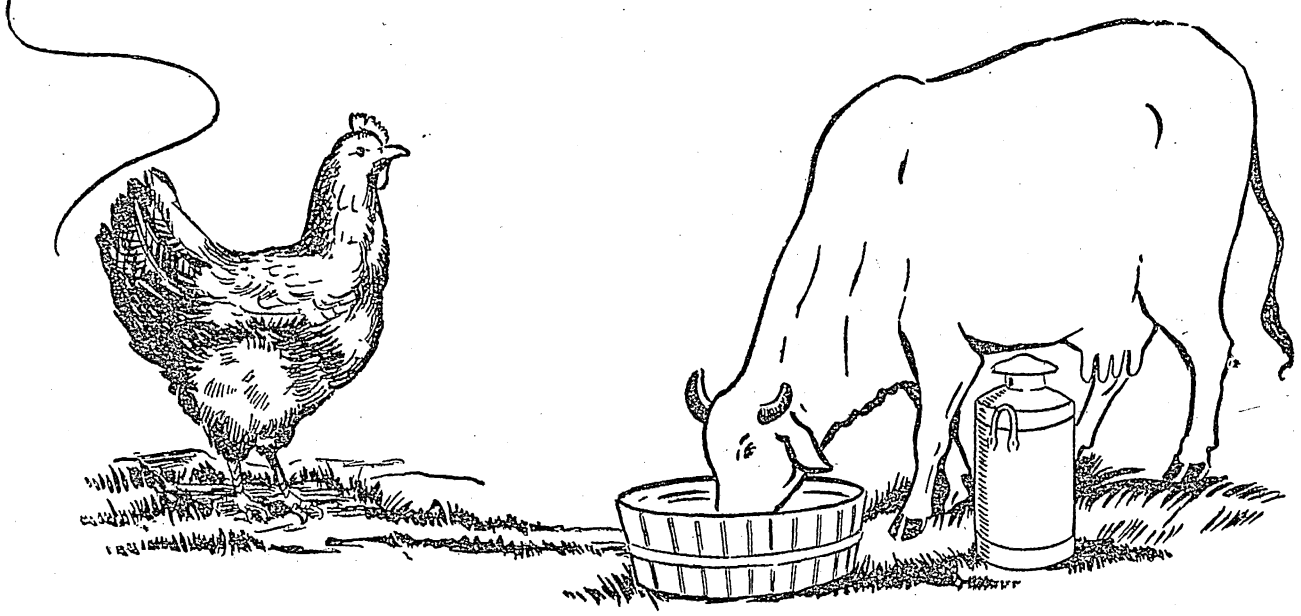
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Bombay Farmers Try A New *Mung*

by

Chandrakant Kulkarni
Agricultural Officer, Agricultural Research Station, Niphad
and
Vasantrao Gaikwad
Assistant Cotton Development Officer, Ahmednagar

IN 1955, Bombay's Department of Agriculture made available to the farmers in the State a new strain of *mug* (*mung*) or *Phaseolus aureus* Roxb. *Mug* is an important crop in the Bombay Deccan, especially in the East Khandesh District. The crop is generally grown as an entire crop, but also raised mixed with *kharif jowar*.

In East Khandesh, an early variety of *mug* locally known as *havara* was very popular till some years ago when the Agricultural Department introduced a variety known as *China mug*. This variety has shining bold grains, is early, and yields high ; it soon became popular with farmers. But the Department wanted to evolve a better strain than *China mug*. Hence, research work was started at the Agricultural Research Station, Jalgaon in East Khandesh, 15 years ago, and as a result, *China mug-781* was evolved.

After comparative trials for a number of years on Government farms had shown that *China mug-781* was better than the local varieties, it was distributed among farmers.

The new strain gets ready for harvest in 60 to 65 days as against 70 to 75 days taken by local *mug* varieties. The variety has a greenish yellow stem and blackish brown pods.

In multiplication plots at the Research Station, the variety gave 400 to 450 pounds of grain per acre, and in favourable seasons, 600 to 700 pounds. In one season at the Research Station at Jalgaon, the yield went up to 700 pounds per acre, but it can be said that on an average the strain gives seven per cent more grain yield than the local variety.

The bumper crop of *China mug-781* at the Agricultural Research Station, Jalgaon



The grains of *China mug-781*, being bold, green and shining, fetch a premium of two to three rupees per maund over the local *mug*, which means that a farmer growing this strain gets Rs. 15 to 20 more per acre by way of profit. The grains also are superior in their nutritive value.

INCREASES SOIL FERTILITY

China mug-781 has a spreading habit of growth. For this reason it does not allow weeds to grow very much. It being a legume, the soil fertility also is increased where it is grown. It also checks soil erosion.

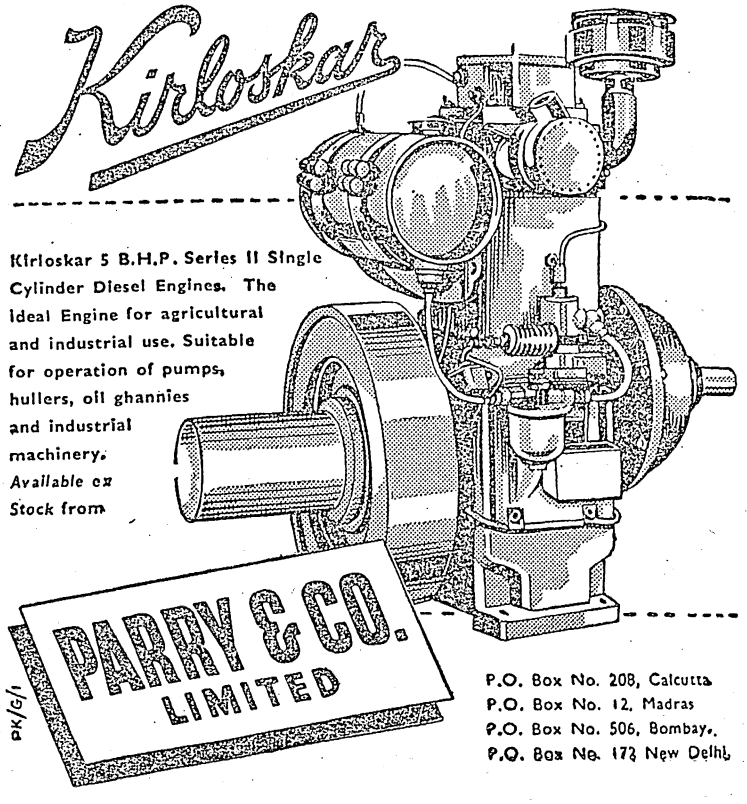
The variety being early, the second picking can generally be finished by the end of August, which makes sowing a wheat crop in the *rabi* season possible on the same land. This, of course, depends upon the availability of the late rains in September-October and also upon the soil type. If, however, the wheat is grown under irrigation, it gives about ten to 30 per cent more yield than when grown on a land which was fallow in the *kharif* season.

Experience also shows that if the *mug* plants after the harvest of the pods are ploughed into the field, they add about 6,000 to 8,000 pounds of green matter per acre, naturally helping to improve the soil and also increasing the yield of the crop that follows.

HIGHER YIELD

China mug-781 has been tried by the farmers in East Khandesh, Surat, Baroda and West Khandesh. They obtained about 20 per cent more yield over the local variety.

China mug-781 is getting popular in Bombay State. This superior strain deserves to be tried in other states also.



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Chinese peasants admiring a bumper paddy crop in the fields of the Touho Agricultural Producers' Co-operative, Hungtse County, in the Huai river valley

Farming Elsewhere

China Modernizes Her Agriculture

AGRICULTURE

by

Chu Chi-lin

CHINA'S industrial and agricultural production are in a new phase of upsurge. Since last September, when the policy of "simultaneously developing industry and agriculture on the basis of priority for heavy industry" was laid down, efforts to boost farm production have gathered momentum.

Winter, which used to be a slack season for rural work, has become a time of feverish activity with over a 100 million peasants pitched in to build irrigation works and collect manure. In five months—from October to February, more than 185 million *mou* (one *mou*=0.1647 acre) had been added to China's irrigated area. This is more than two-thirds as much as all the land irrigated in the four thousand years of China's history. In many provinces, the plan is to reach the per unit area crop-yields specified in the National Programme for Agricultural Development (1956-67) by as much as five years ahead of schedule.

This "leap forward" in agriculture provides the impelling power for a further rapid advance of industry. During this year, the machine-building industry plans to supply the farms with pumps for irrigation and drainage with a total of half a million horse-power—just about the total capacity already at work in the fields. Other industries, particularly the chemical fertilizers industry, are making similar headway.

IMPORTANCE OF AGRICULTURE

Agriculture has always received considerable attention in China. The importance of agriculture to industry was made clear by the actual progress of the First Five Year Plan. The rich harvests of 1952 and 1955, for instance, resulted in comparatively rapid advances in the national economy in 1953 and 1956, the industrial output (excluding handicraft production) increasing by 31.7 per cent and 31.1 per cent, respectively, as compared with the previous years. The development of the national economy in 1955 and 1957, on the other hand, had to contend with the drag of the crop failures in 1954 and 1956. The total industrial output grew by only 7.8 per cent in 1955 and 6.9 per cent in 1957.

The reasons for the profound influence of agriculture on China's national economy can be summarized as follows.

First, though industry has made great strides in the past few years, agriculture still holds a dominant position in China's economy. It still accounts for nearly half of the total value of industrial and agricultural output. By net output value (i.e., the value of total output minus that of the materials expended), agriculture accounts for nearly two-thirds. In other words, it is the main source of China's national income, of which it provides about one half.

Secondly, about half of the industrial production relies mainly on agriculture for raw materials; for light industry, the proportion is four-fifths. Therefore, the growth of industrial production, particularly in consumer's goods, is largely determined by the growth of agriculture.

Thirdly, about 80 per cent of all goods sold in the home market consist of farm produce or processed farm produce. About three-quarters of China's export goods are agricultural products or their derivatives. A good or bad crop also affects the home and foreign trades.

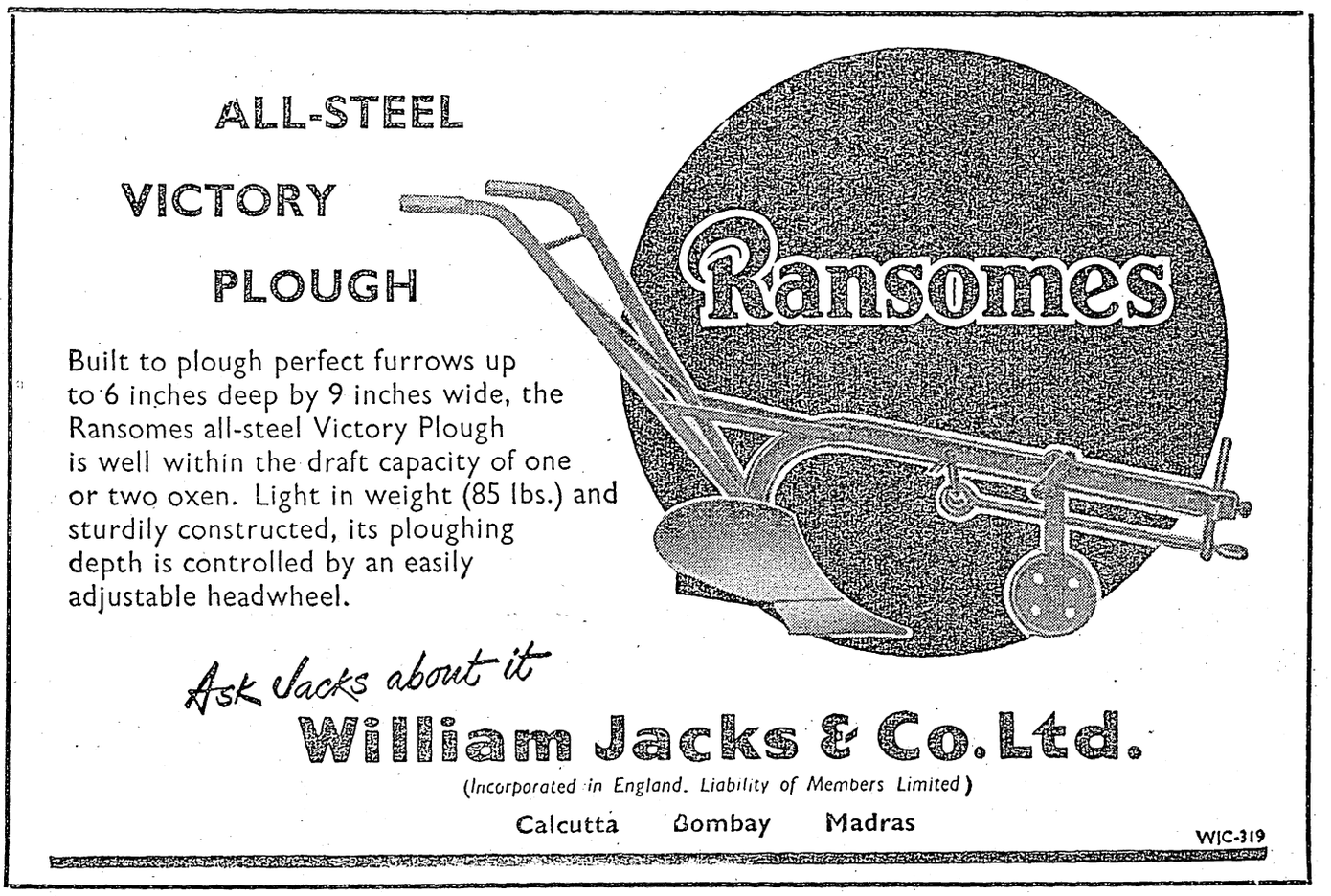
Fourthly, about 55 per cent of the state's revenues is drawn, directly or indirectly, from agriculture. The revenues went up by 23.9 per cent in 1953, and by 15.8 per cent in 1956. In 1955, the revenues increased by only 3.7 per cent; in 1957, the increase was only 6.8 per cent.

Lastly, China's vast rural areas offer the biggest market for her industry. The monetary income of the peasants makes up about 60 per cent of that of the whole nation. Most consumers' goods are sold to the peasants, and their demand for hard goods is mounting daily. Growth in agriculture, and consequently in the rural market, is a stimulus to the development of industry.

Thus, it will readily be seen that the acceleration of agricultural development will not retard the advance of industry. On the contrary, it will step up industrial growth by speeding up raw material production, expanding the home market and increasing capital accumulation.

BALANCED ECONOMY

From the point of view of the balance of the whole national economy also, a simultaneous development of industry and agriculture is imperative. The production of capital goods must meet the needs of national construction, and the production of consumers' goods must meet the rising everyday needs of the people. In recent years, national construction and people's purchasing power have grown to such an extent that both capital and consumers' goods tended to be in short supply.



But these two types of shortages are different in nature, and cannot be dealt with in the same way.

In the case of capital goods, production is quite regular and growth fairly rapid; it is comparatively easy to bring the demand for them under control by regulating the speed of capital construction—or in some cases, to fill gaps by imports from abroad.

But with consumers' goods, it is different. Their production is not so regular and their growth is slower. Furthermore, population increases and improved living standards make the demand for consumers' goods rise very fast, in a way difficult to control. It is also quite impossible to import any appreciable proportion of China's vast needs in consumers' goods. This renders the development of agriculture and light industry all the more necessary.

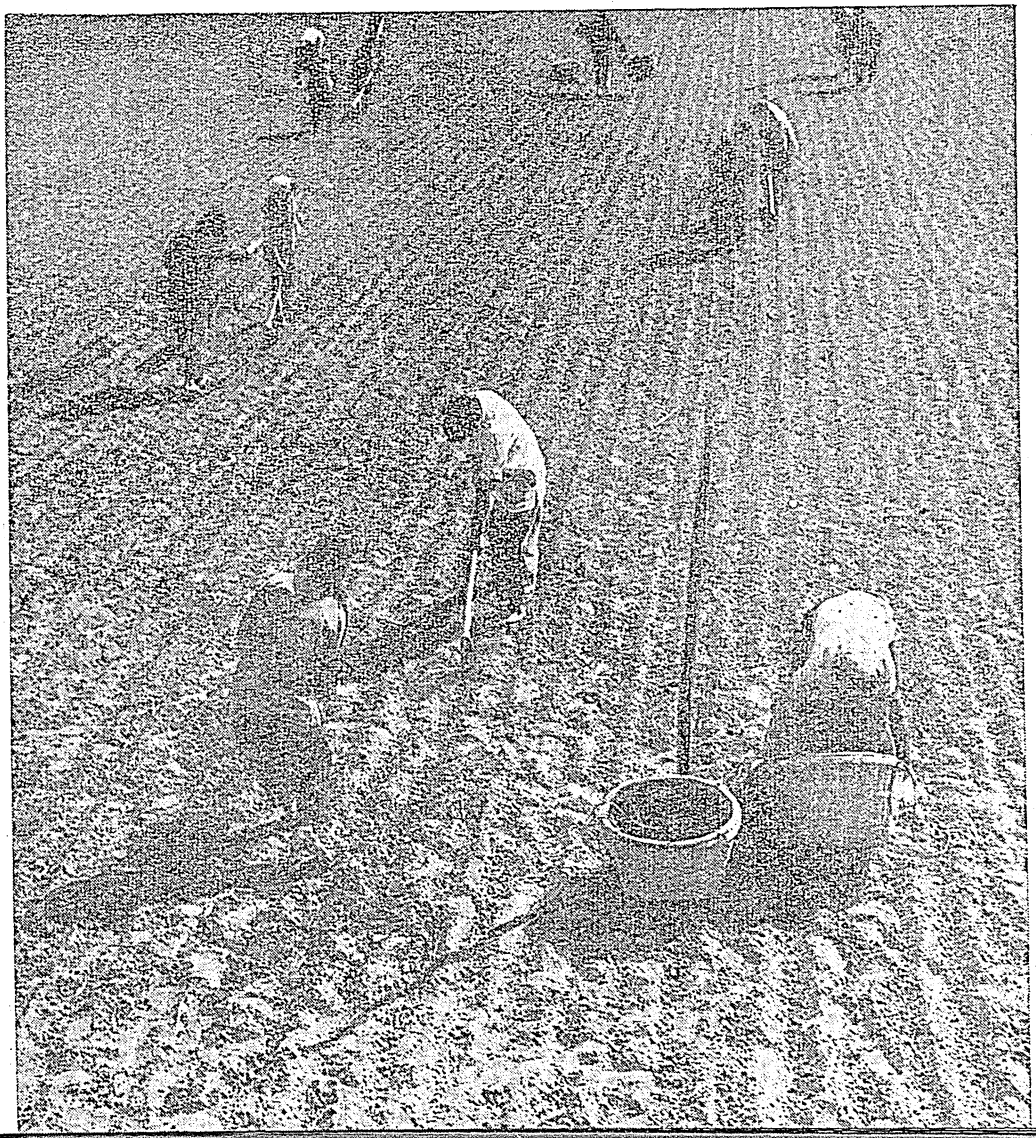
The tempo of agricultural advance in China, as may be seen from the fulfilment of the First Five Year Plan, has been fairly rapid. The average annual rate of growth of total value of gricultural output between 1953 and 1957 was 4.5 per cent, exceeding the planned rate of 4.3 per cent.

DOUBLE GRAIN OUTPUT

Nonetheless, taking into consideration the constant rise in production, the growing needs of the people, the rapidly growing demands of national construction and the high speed of industrial development, China's agriculture is still lagging behind. To stimulate its further progress, the Central Committee of the Chinese Communist Party put forward, in January, 1956, a Draft National Programme for the Development of Agriculture, 1956-67. This draft programme was revised last year, and according to this revised draft programme, by 1967, the nation's grain output will be two and a half times that in the rich harvest year 1955 and cotton output thrice as much.

Big advances are also called for in other activities connected with agriculture such as rural trade, communi-

Members of an agricultural producers' co-operative in Szechuan province, China's leading grain-producing province, sowing wheat in lines



cations and transport, the fight against serious diseases, elimination of illiteracy and improvement of housing. This is a great programme for building up a Chinese countryside totally different from the old.

Is it possible to carry it out ?

Although the time when China can avert all natural calamities will not come soon, and she still lacks capital and equipment for rapid mechanization of agriculture or large scale reclamation of wasteland, conditions for the development of agriculture are already far better than what they were during the First Five Year Plan.

CO-OPERATIVE ECONOMY

Foremost among the changes is the transformation of the small-peasant economy into a co-operative economy. At the start of the First Five Year Plan, the former was still dominant in China which had then only 3,644 agricultural producers' co-operatives, mostly elementary in form. But by the start of the Second Five Year Plan, the socialist transformation of agriculture was virtually complete; we now have a socialist co-operative farming.

The advantages of co-operative farming have been proved by facts of the past years.

MORE YIELD

Today, the chief way to increase agricultural production is to raise yields per unit area. For this, a gradual improvement in agricultural techniques is required.

After the completion of the First Five Year Plan, China's industry is in a better position to give support to agriculture. During the Second Five Year Plan, the tractor plants in Loyang and Tientsin will start operating and supply the countryside with various types of tractors. The engineering industries will be sending to the countryside large quantities of irrigation pumps, harvesters, cultivators, tractor sowers, threshers and means of transport—all specially designed for use in the Chinese countryside.

In the chemical industry, China today is making complete plant equipment. Her 1957 output of chemical fertilizers was about 8,00,000 tons; by 1962, it should be more than ten million tons. With the development of the chemical industry, the production of artificial and synthetic fibres will also grow fairly rapidly. This will make it possible to cut the acreage of industrial crops, and grow more food crops. The fuel and communications industries will also give more support to agriculture.

INVESTMENTS IN AGRICULTURE

Since the State will be investing more in farming, and the co-operative farms will have accumulated more funds, the expansion of productive facilities in agriculture during the Second Five Year Plan will be doubly guaranteed. In the First Five Year Plan, State investments in agriculture, forestry and water conservancy were set at 5.9 per cent of the total; in actual fact, however, they stood at eight per cent. The Second Five Year Plan calls for more than ten per cent of the total State investment to go into agriculture.

During the First Five Year Plan, the peasants themselves accumulated funds amounting to 12,000 million yuan; in the Second Plan period, the amount may be 50 per cent higher.

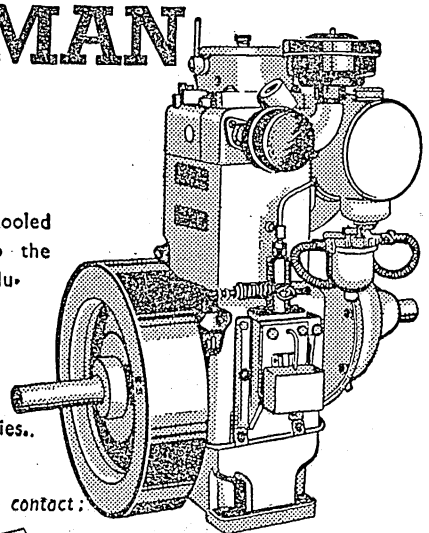
The First Five Year Plan included some 100 big (high-investment) construction projects in agriculture, forestry and water conservancy. They will be making a further contribution to agriculture.

Finally, in the past few years, the Government, both at national and local levels, have amassed much useful experience in guiding agricultural production. Yields of a 1,000 *catties* (one *chin* or *catty*=1.1023 pounds) per *mou* for food crops, and a 100 *catties* per *mou* for ginned cotton, are no longer unusual. When the secret of these successes is shared among many, the cumulative results will be immense.

A greater emphasis on agriculture, of course, does not mean that industry will not be vigorously promoted. Industry is the leading force of the national economy, and heavy industry is the material basis for expanded socialist reproduction. Therefore, heavy industry will continue to be given priority. During the Second Five Year Plan, it is expected to more than double its output. And those, branches which are of direct or indirect service to agriculture will achieve an even higher rate of growth.

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The Farmer's Point of View

we surely can raise coconut production higher

by

R. Srinivasa Iyer

MADRAS State has the credit of taking the lead in coconut research. After the re-organization of states, Madras is reported to be the third biggest in India for coconut production. Of the 1.5 lakh acres under coconut in the State, a third is found in Tanjore district. With confidence I can say that this district has the highest average yield per tree than any other district in the State. As against the 50 nuts a year per tree, the average for the country, Tanjore with its fertile soil easily has an average yield of 75.

The coastal areas in Tanjore suffered from two successive cyclones in 1952 and 1955, as a result of which the best yielding trees were lost. All the same, the growers quickly replanted the gardens with quality seedlings supplied at concessional rates by the State Government. In the next three or four years these new trees will start bearing, restoring to Tanjore district its old position regarding coconut production.

QUALITY SEEDLINGS

Since some years, the State Government has been supplying quality seedlings on a large scale from specially raised nurseries. They are also initiating schemes for large scale planting of areas in the coastal belt in Ramanathapuram and Kanyakumari districts. It is necessary that such a scheme should be extended to the Tanjore district which has a long coastal line of over 200 miles, and also a soil suitable for the growing of coconut. In fact, the whole coastal belt in Madras State can be covered with new plantations; its soil and seasonal conditions provide good scope for a large scale development of coconut.

There are some things which have to be looked into to step up coconut production in the State.

There is no correct information available on the area or the number of trees or the average yield per tree. Since statistics are very important they have to be gathered immediately for the taluk, district and the State.

SOIL SURVEY

A detailed survey of the soil and underground water resources will have to be undertaken by the Agricultural Department all along the coastal belt adjoining the Bay of Bengal and the Palk Straits, particularly of the land lying waste but suitable for bringing under coconut plantations. The few trees which are seen here and there clearly show that the coconut will come up very well in this tract. In other districts also a soil survey will help in selecting sites suitable for coconut plantations.

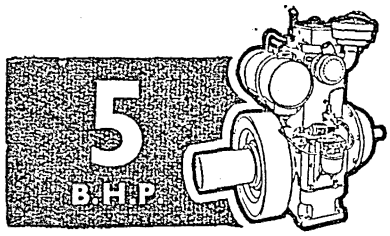
The coconut palm needs a continuous and good care throughout its life to yield well. Farmers have to be told about the proper selection of site, selection of seed nuts, raising quality seedlings, planting, after-care of plants, prevention of diseases, methods of manuring, intercultivation, manufacturing copra and extracting oil and marketing. Probably, an intensive educational drive with a special Coconut Development Officer to guide it on proper lines will be necessary. There is one such officer in Orissa, though in the State there are only a few thousand acres under coconut. With such good potentialities as we have in Madras State there is no reason why we should not have a special staff for intensifying coconut production.

Though millions of seedlings are planted every year in the State, many are lost because of inadequate care. With proper spacing, planting and manuring, and taking the number of trees as 75 per acre and average yield as 75 per tree we should easily expect 5,250 nuts per acre. Our average is about 2,600. This means that with proper attention the production can be doubled.

DEMONSTRATION PLOTS

To help achieve this, demonstration plots in private plantations should be opened and results of research in manuring, inter-cropping and plant protection should be carried to the homes of growers, which can be achieved with a special staff.

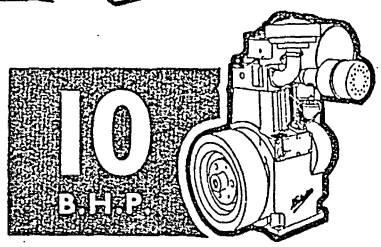
Madras State has recently acquired land for a coconut research station at Veppangulam near Pattukkottai. This will prove to be a useful institution. Though the State scheme for the supply of quality seedlings on a large scale is working very satisfactorily, it is likely that more nurseries will have to be started to cope with the demand which will increase.



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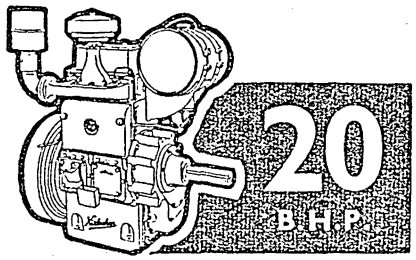
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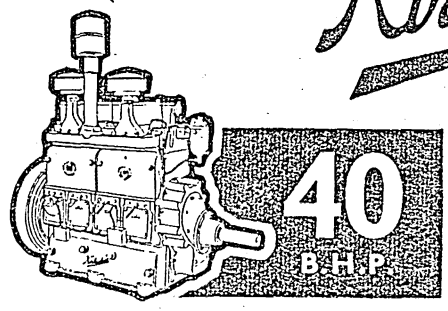
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In Tanjore district, farmers do not grow any subsidiary crops in coconut gardens. The gardens are ploughed only twice or thrice a year. No manuring is done. Experiments have shown that perennial root plants like the mango or the jack can be grown properly spaced between the coconut trees. Annual crops like groundnut, turmeric, redgram and castor can also be grown easily. Such intercropping will not only conserve moisture, but also increase the coconut yield. There is also the possibility of growing green manure crops for ploughing in for the coconut, and if there be excessive growth of the green manure crop a part can be cut and used for the wet lands also.

To induce more people to take to coconut cultivation and intensify the same, it is necessary that they are supplied with seedlings, manures and pesticides at subsidized rates and also provided with loans at low rates of interest.

MARKETING FACILITIES

Apart from encouraging coconut production, equally important is the marketing aspect. Farmers need facilities for making copra, extracting oil and marketing coconuts or the finished coconut products. Middlemen, brokers and village merchants take away a large slice of the price paid by the consumer by way of overestimation of moisture in the copra, fraudulent weighing, deduction of *mamools*, brokerage, loading and unloading charges, etc. Multi-purpose co-operative societies, at the taluk and district levels will enable the grower to get a fair and economic price. Such societies should have facilities for grading and storage of produce, sufficient funds for advancing loans on stocks of raw coconuts and copra and means of quick transport to distant and favourable market.

These societies can also instal standard types of hot air driers with financial assistance from the State Government. National Co-operative Development and Warehousing Board can also help the State Government with loans for contributing the share capital of such societies. Regulated markets should be established at district centres and in Madras city.

In Madras State, coconuts are largely sold raw. For local sale they are fully husked and for exports partially. There is practically very little of copra manufacture or grading. Hence it is necessary to introduce kiln drying as well as commercial production of copra and extraction of oil. The coconut oilcake available in the State is also not preserved in the proper way. It easily deteriorates as a result. The cake is a good feed for cattle, especially the milch cattle.

Many still have a superstition that a coconut tree should not be cut and as such even non-bearing and uneconomic trees are allowed to remain in the gardens. This superstition will have to go. Due to the improper selection of seedlings and seed nuts even young trees do not yield sometimes. Such trees as well as those old ones which have become unproductive should be cut and underplanted. The systematic underplanting of old gardens should also be undertaken.

The Indian Central Coconut Committee has been doing a good work on the improvement of the coconut. The research results available have to be carried to the village growers. For this purpose, a sufficient effective information campaign should be initiated.

With all these measures there is no doubt that coconut production can be taken up to a high level in Madras State.

EACH FIELD CAN GROW ITS OWN MANURE

(*Contd. from page 29*)

locations of land, the green manured paddy crop fares better than in unmanured fields. The extension of green manuring in these areas will, therefore, help to tide over the failure of the monsoon rains at critical periods in the growth of paddy crop.

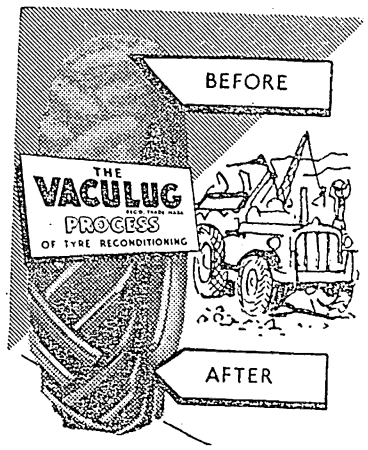
SEED DISTRIBUTION

In the last cultivation season, an attempt was made at my instance, to develop local production of green manure seeds in the States of Bihar, West Bengal, Assam, Orissa, Uttar Pradesh and Madhya Pradesh with the active co-operation of the State Agricultural and Development Departments. Nearly two million packets of green manure seeds were distributed in these States, each packet costing about an anna and sufficient for sowing on the borders of a one-acre field.

Based on the experience gained, arrangements have been made to distribute 6.5 million packets of seeds in these states in the current year. If the programme is fully implemented, there can be no doubt at all that green manuring can be extended to over 12 million acres in these states during next year. Sufficient seeds would be available by the end of this year to secure border planting in 1959 in 50 million acres which can be green manured in these states alone. The programme for production of green manure seeds has to be vigorously extended to most of the other states, so that green manuring becomes a normal practice on over 100 million acres where it can be adopted at present. The development of rural composts by producing the required plant materials by border planting has to be developed in the rest of the country.

TREMENDOUS POTENTIALITIES

Taking an overall picture of cropped area of over 300 million acres in the country with acute deficiency of a vital growth factor like soil nitrogen, the potentialities of development of green manures and rural composts are tremendous. The principles of self-help and self-reliance have their particular application in this programme of producing the manure required for each field from the field itself without affecting the other uses of the field. Success depends upon systematic effort and the ability of the cultivators to plan ahead to produce the seeds and plant wastes necessary for production of manures. This is a practical and feasible approach to the problems of agricultural production, which has produced tangible results in some of the southern states. The cost involved is less than an anna per acre, and if this method is fully and rapidly exploited there can be no doubt at all that we can step up the present output of foodgrains and make India surplus in this respect for many years to come.



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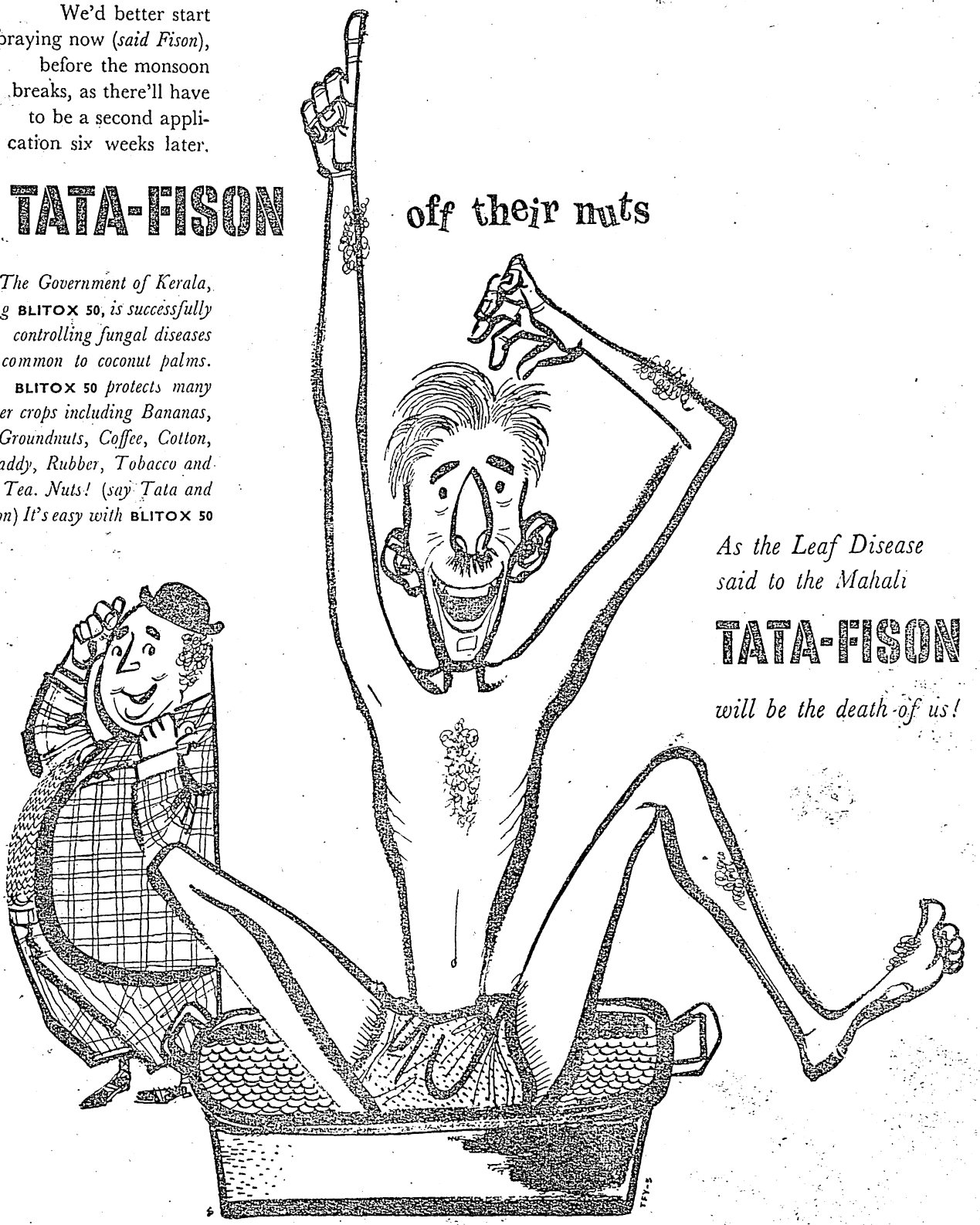
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Eureka! (*said Tata*).
Don't be nutty,
it's *Areca* (*said Fison*).
I've found signs of Mahali
in the grove (*said Tata*).
Just the job for BLITOX 50.
We'd better start
spraying now (*said Fison*),
before the monsoon
breaks, as there'll have
to be a second appli-
cation six weeks later.

TATA-FISON

off their nuts

The Government of Kerala, using **BLITOX 50**, *is successfully controlling fungal diseases common to coconut palms.* **BLITOX 50** *protects many other crops including Bananas, Groundnuts, Coffee, Cotton, Paddy, Rubber, Tobacco and Tea. Nuts! (say Tata and Fison) It's easy with* **BLITOX 50**



As the Leaf Disease said to the Mahali

TATA-FISON

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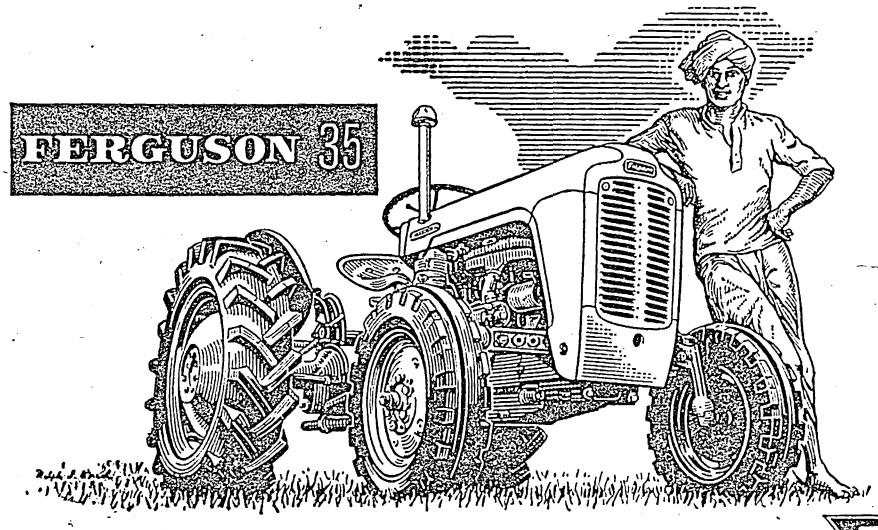
My basic job is to assist in raising this country's food production from its present low level—so low that we have to buy abroad.

The extent to which I can help is very often not realised—it certainly is not realised enough.

Whether it is wheat or rice—gram or grass—sugar or groundnuts—whatever it is, only I can reliably and economically:

- **Have the soil ready for the rains or water,**
- **Prepare the best tilth to suit the crop,**
- **Sow quickly and well on the right day,**
- **Give the crop attention whilst it grows,**
- **Harvest at the right time,**
- **Do, in time, all those never-ending duties such as agricultural haulage, soil conservation, water distribution and so on—which mean the difference between shortage and enough.**

MECHANISATION MEANS MORE MEALS



MHFY-4

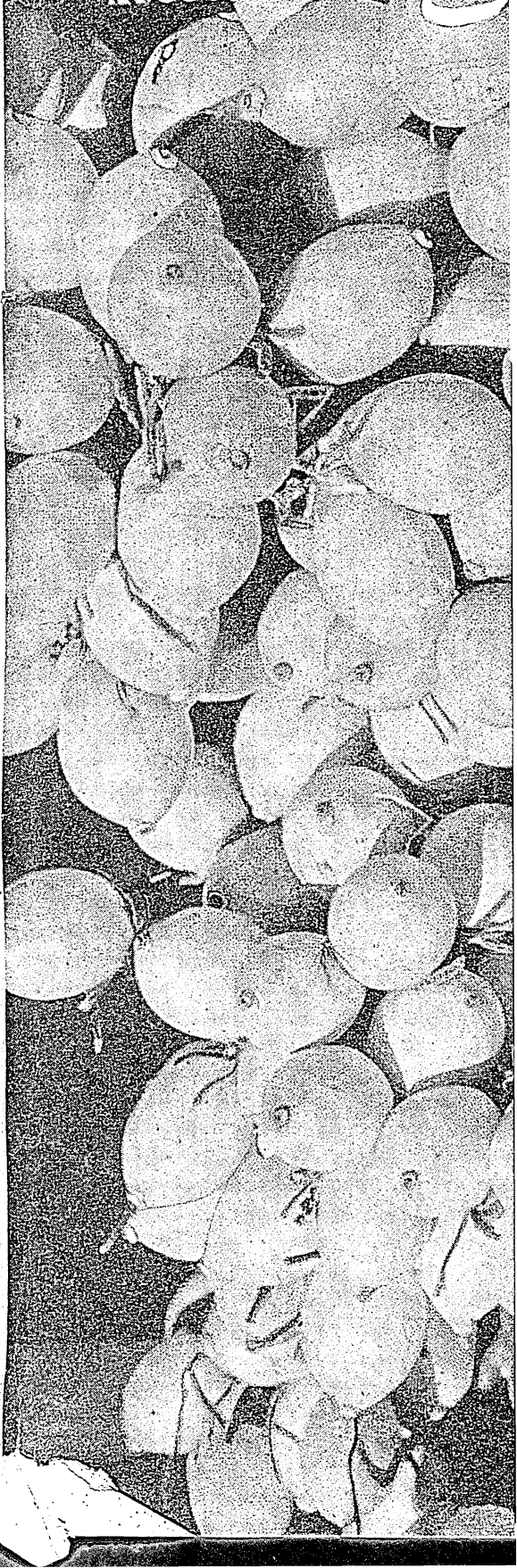
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As the Webbing Caterpillar said to the White Jassid

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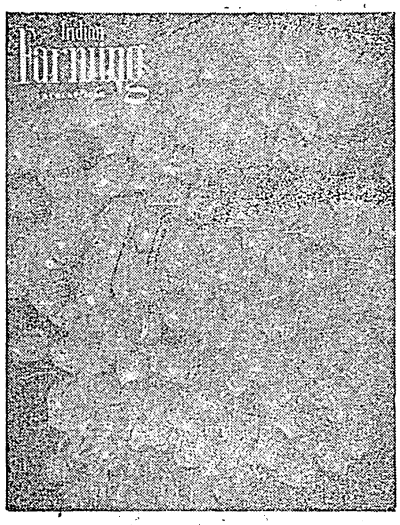
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Photo by H.K. Gorkha

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...towards better health

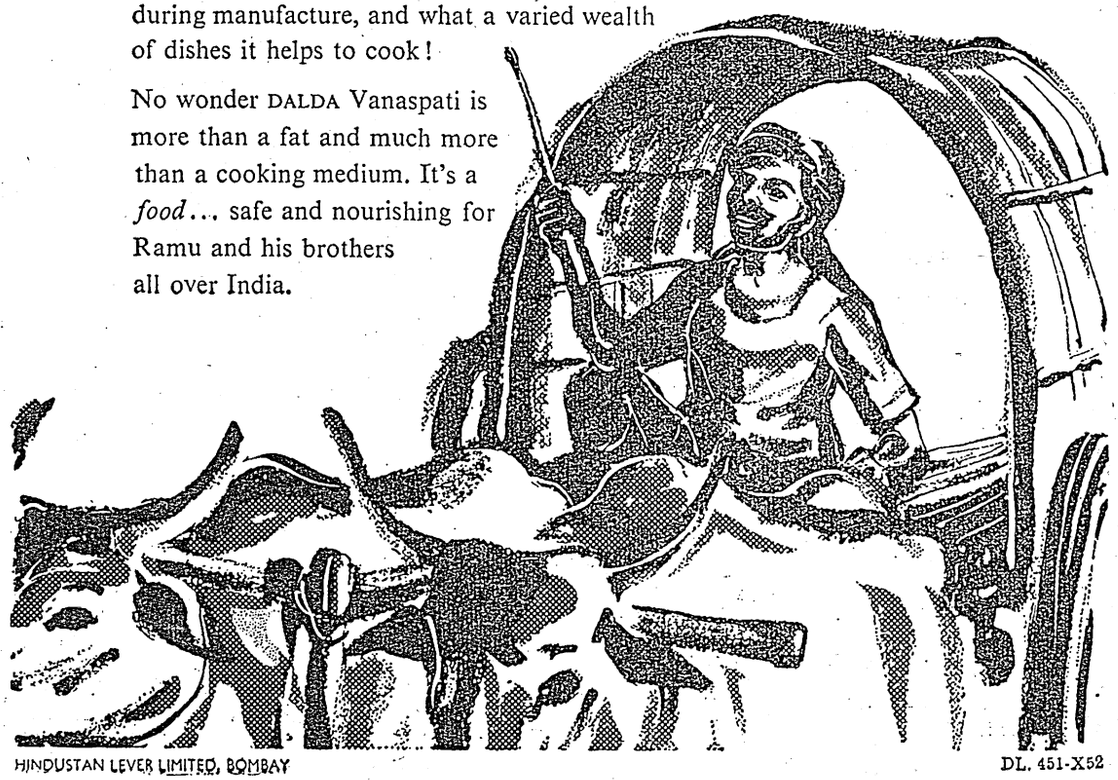
TO RAMU, the carter, a qualified doctor was once a rare and wondrous personage; and health centres were as unusual as mangoes in December.

National Extension schemes have changed all that. Today, the doctor is a good friend of Ramu's and the health centre is part of his village life. Through them, the best defence against disease has come to Ramu: *Health Education*. He is learning, for instance, how health and resistance to sickness depend a good deal on the food he eats — on a *balanced* diet.

Such a diet, of course, comprises proteins, carbohydrates, minerals, vitamins. And fats. Fats provide 2½ times as much energy as wheat or rice, and build up the body's resistance to disease.

Take a cooking fat like DALDA. Here's a brand of vanaspati that more and more people are using, in villages as in towns. Made from pure vegetable oils, DALDA has 700 International Units of Vitamin A added to every ounce — as much as there is in good ghee — plus 56 I.U. of Vitamin D. It is untouched by hand during manufacture, and what a varied wealth of dishes it helps to cook!

No wonder DALDA Vanaspati is more than a fat and much more than a cooking medium. It's a *food*... safe and nourishing for Ramu and his brothers all over India.



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THE LITTLEST THINGS

ATTENTION to a few little things in farming many a time means a lot.

Rogueing out that part of the crop reserved for seed, for example. The seed will be pure, and the next crop, better-yielding.

Now here's a little thing that all virginia tobacco growers would do well to pay heed to. It is about the transport of the leaf from the field to the barn.

IN Andhra Pradesh, when the flue-curing barns are in the villages and the fields are a couple of miles away from the barn site, the harvested leaf is carried to the barns *heavily packed* in bullock carts—and yes, sometimes the field workers would also like to squat or trample over the packed leaves.

THERE are two things to be said about this: one, the physical injury caused to the leaf; two, leaf spoilage due to the heat produced in the mass of heavily packed green leaf. Result: low grades and scrap, and lower profits.

To avoid this, those who know say that the leaf should be strung *before* transport and not *after*. The primed leaf should be strung in shade in or near about the field, and the strung leaf transported undamaged by making it hang loose from sticks loaded in rungs on the side-frames of the cart.

NATURALLY, this means less of leaf per cart trip. Instead of the usual three trips the farmer makes to carry a barn load, he has to make two more. This may cost him a rupee or two more, but his profits per charge will go up by Rs. ten to 15!

LITTLE things many a time mean a lot. This time it means more profit per acre, better prestige for the farmer as a producer of good tobacco and no problem of finding a market for low grades and scrap.

SOIL BY THE CARTLOAD

IF you are farming in the "precarious" rainfall areas of the Bombay-Deccan, and even if you are not, it will shock you to hear what it will cost you not to follow proper crop husbandry practices.

WHEN your land is under natural vegetation, you lose only a cartload of soil per acre per year by erosion. But you remove the natural cover, and you lose 35 cartloads of soil per acre per year!

AND you plough your land and harrow it, but don't grow any crop on the land, what then? The erosion losses will be to the tune of 65 cartloads per acre per year!

YOU grow a *rabi jowar* crop in the previous *kharif* season, you are in for trouble. The erosion losses mount to 70 cartloads per acre per year.

AND look at this: you protect your land well with natural vegetation. Nature will have to work on your land for 2,000 years before she can remove the valuable top seven inches of soil. You raise only a *rabi jowar* in the year, and in 31 years your top seven inches of soil would have vanished!

Man of the Month

Golden Rules Get The Best From Poultry Birds

by
Harkirat Singh

"UNLESS one unravels those 'golden rules' of poultry-keeping one cannot make much headway in this delicate job," is the belief of Shri H.S. Bhatia. I met this Delhi poultry enthusiast a few days back at his farm in Bagh Darbar Khan.

Bhatia told me that the main idea with which he had first purchased 20 birds was ensuring a "tamper-proof" wholesome food for his family. "As time passed by and I gained confidence in the handling of birds, the idea of catering to the needs of friends and neighbours struck me, and I added more birds to my flock," he went on.



Shri Bhatia with one of his Light Sussex cocks

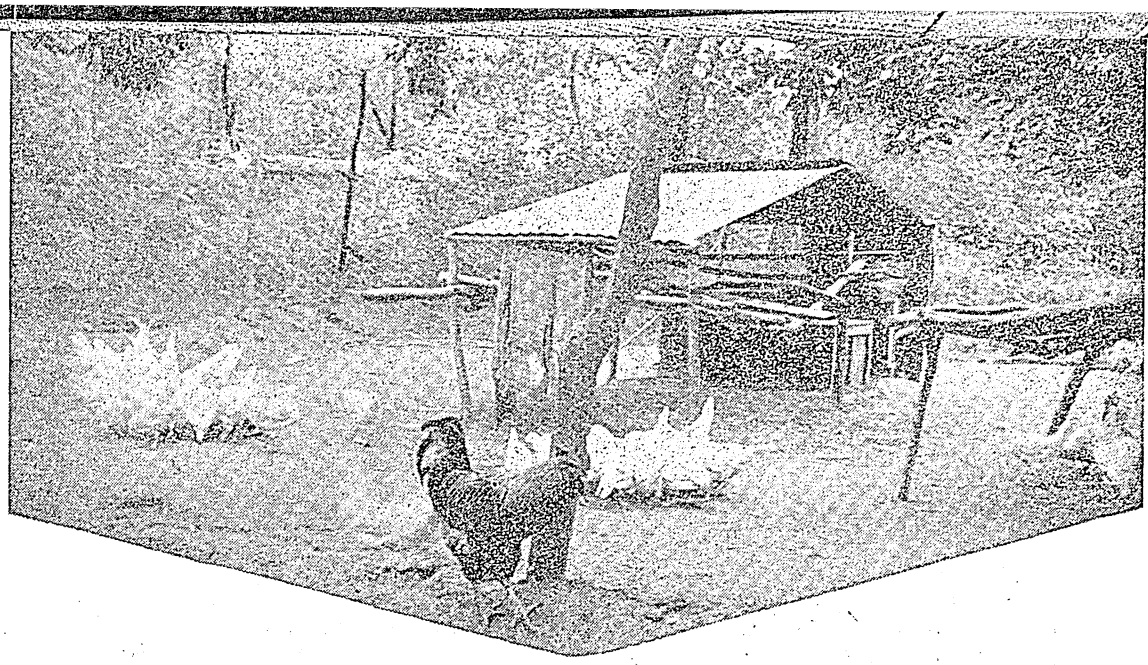
ATTRACTIVE PROFITS

The profits that came in were quite attractive, and so there came a day when Bhatia started looking for some spacious premises to start a full-fledged poultry farm. He selected the present site, extending over $1\frac{3}{4}$ acres, and gave his enterprise a name too—"Bhatia Poultry Farm." The present strength on the farm is 750 birds, which includes 150 layers.

On my pointing out whether the present site being located at quite a distance from his residence, was not inconvenient to him, prompt came his reply: "That makes for the first golden rule in my bag: this is an open space, is on a main Delhi road, a tree here and a tree there shelters birds from heat, the grass provides green feed to the birds, water supply is plentiful. These advantages amply compensate me for any inconvenience."

WHAT BREED

"Next," he went on, "no haphazard buying of birds. Be definite about the breed or breeds you would like to keep."



Proper housing of birds receives particular attention on the Bhatia Farm...

In his case, for example, he prefers the White Leghorn. "For table egg production, they are the best, I should say, and, moreover, the Delhi climate suits them very well," he opined.

Coming to the next tip, he put it simply as "no chances with the birds' health." "The way of achieving this is as simple," he pointed out. "Airy cages, clean pens, no overcrowding of birds." On the Bhatia Farm, cages are swept thoroughly every morning and lime sprinkled over the floors. Their construction is tick-proof and they are easy to clean.

"The moment I am suspicious about the health of a bird in the flock, I segregate it to the 'sick ward,' and I'm ready with my syringe and needle to give it a penicillin injection, or whatever treatment is required. Birds are provided with 'Gammexane'-mixed sandbaths and Ranikhet vaccination is a regular routine on the farm," he added.

MASH TIME

As I moved about the farm, birds were being fed with mash, for it was mash time, I was told. "Any neglect in proper feeding could lead to disastrous results," Bhatia was of the view. Then he detailed to me the "what and how" of feeding on his farm.

At 6 a.m., *dara* mixture (containing cuttings of wheat, barley, *jowar*, etc.), bought from grocers, is fed to the birds.

At 11 a.m., they get mash containing: groundnut cake, 40 per cent; maize flour, ten per cent; maize glutenmeal, 20 per cent; *chokar*, 15 per cent; meatmeal, five per cent; common salt, one per cent; shark-liver oil, one per cent; bonemeal, five per cent and seashells, three per cent.

At 3 p.m., greens are fed. Usually, it is *palak*, discarded vegetable leaves from the *subzi mandi* or berseem, according to availability.

At 4 p.m., meat offal mixed with *chokar* at two ounces per bird is given.

The last feed of the day, at 6.30 p.m., is maize, whole or cuttings.

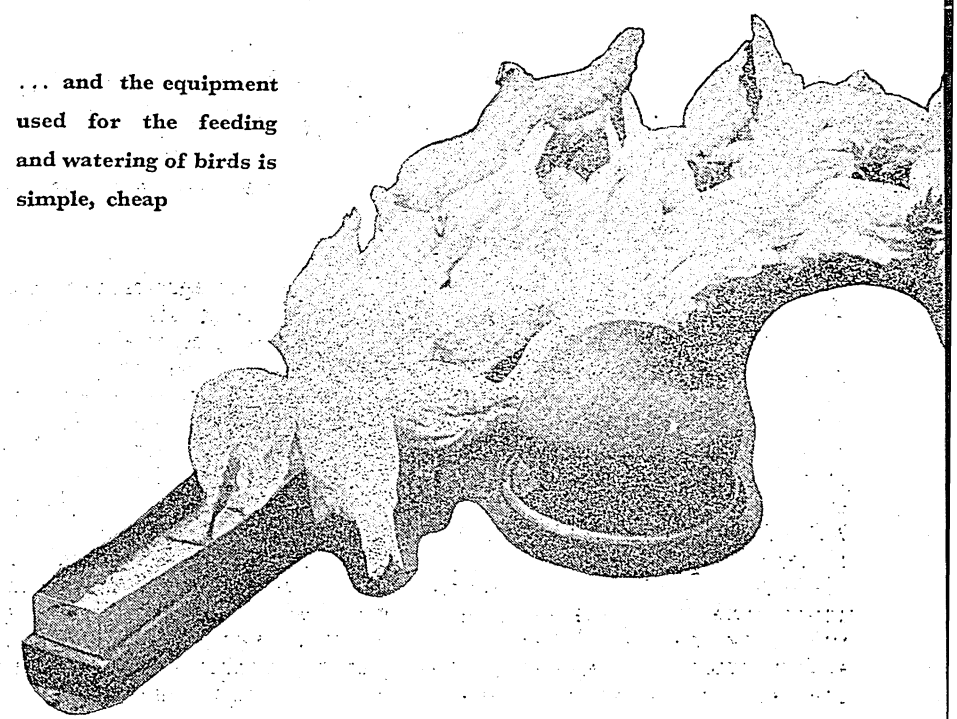
The birds get buttermilk throughout the day.

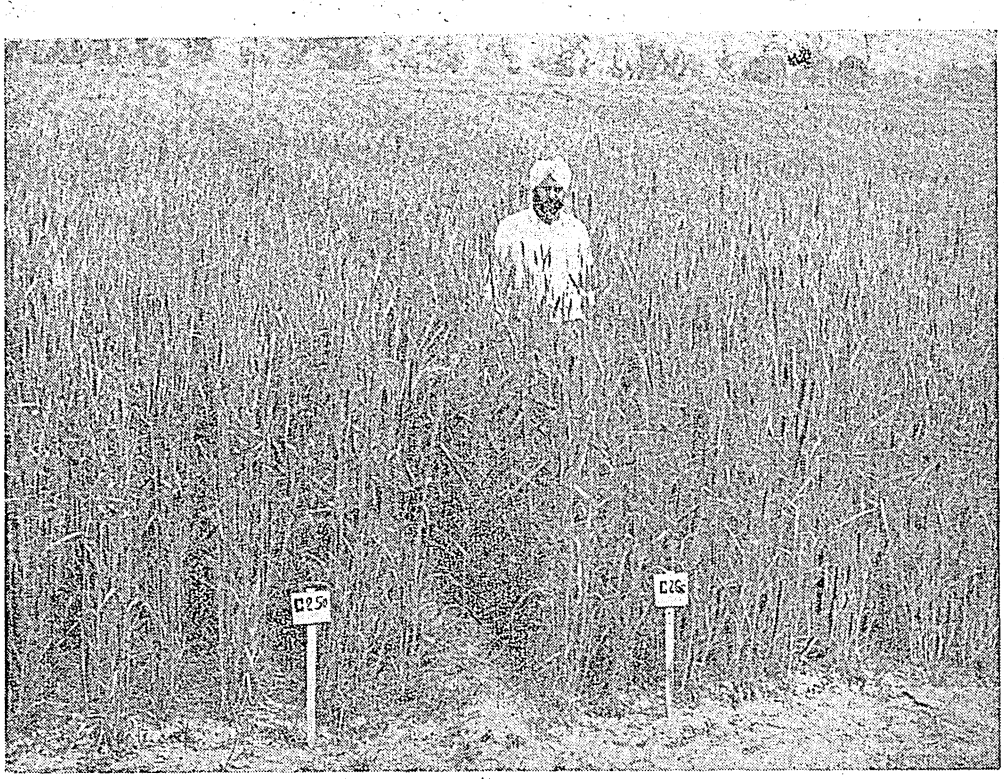
The feed is made available to the birds in hoppers, which are quite cheap in construction. The birds drink water from a device that prevents them from stepping into it and making it dirty.

"Last but not the least, is learning from others' experience," put in Bhatia. I never fail to meet at least one of my fellow poultry-keepers every week for a mutual exchange of experiences, and, to tell you the truth, whatever I know, I have learnt in this way only," he admitted.

"My aim," Bhatia added, when I prepared to leave, "is to build up a nice, faultless flock of a 1,000 laying birds, and next time you come here you may probably see my dream realized."

... and the equipment used for the feeding and watering of birds is simple, cheap





A crop of *C250*, the outgoing wheat (*left*), is seen alongside a crop of *C286*, the new rust-resistant variety (*right*), at the Gurdaspur Substation

A New Wheat Makes its Mark in the Punjab

by

Gursham Singh, Economic Botanist (Cereals and Pulses), Jullundur

D. S. Athwal, Assistant Wheat Breeder, Gurdaspur

and

Avtar Singh, Agricultural Inspector, Wheat Breeding Substation, Gurdaspur

AMONGST the new wheat strains recently developed at the Wheat Breeding Substation, Gurdaspur, Punjab, *C286* has been giving a very outstanding performance for the last five years. It has bold, attractive and hard, amber grains and makes very good *chapatis*. Above all, it is highly resistant to yellow rust and moderately resistant to black rust.

For the past 50 years, several improved varieties of wheat have been evolved by the Punjab Agricultural Department and released to the growers in the State for cultivation under different agro-climatic conditions. Although some of the improved wheats, especially *C591* and *C518*, became very popular with the farmers and were widely grown, both the varieties have been found to be highly susceptible to fungal diseases of which the three rusts—black, brown and yellow (*koongi*)—and loose smut (*kanghiari*) are the most serious. Consequently, wheat yields are considerably reduced every year, particularly in the submontane region which offers ideal climatic conditions for the development of fungal diseases.

The submontane tract in the Punjab comprising the Gurdaspur and Hoshiarpur districts and the lower altitudes of the Kangra district, is an important wheat-growing region where about six lakh acres of land are annually put under this crop. As the wheat variety *C591*, due to its high susceptibility to rusts, was unsuitable for cultivation in this area, research work was undertaken on a regional basis at the Wheat Breeding Substation, Gurdaspur, in 1941, to evolve a commercially desirable rust-resistant variety of wheat. As a result of this work, an improved

variety, *C250*, was evolved and released to the growers in 1944 for cultivation in the tract.

Studies on rust carried out in this country and abroad have shown that a variety resistant to a particular kind of rust at the time of its release may be rendered susceptible to it with the appearance of a new race in that rust after a few years. Breeding for resistance, therefore, is a never-ending race between man and nature.

The variety *C250* which exhibited a high resistance to yellow rust at the time of its release has, in recent years, succumbed to its attack. Moreover, *C250* is heavily susceptible to black rust.

Evolved from a complex cross, viz., *C250* x [*C591* x (*Punjab Type 1* x *Khapli*)], *C286* has derived its germ plasm from three wheat species, i.e., *Triticum dicoccum* (*Khapli*), *T. durum* (*Type 1*) and *T. vulgare* (*C591* and *C250*). It is earlier in maturity than *C250* by about a week, and on that account a timely sown crop of *C286* usually shows a complete freedom from black rust which appears with the onset of the warm weather. *C286* also possesses some resistance to brown rust and loose smut, and is, therefore, never seriously damaged by these.

GOOD STAND

C286 is a bearded variety with smooth, white glumes and mid-lax ears. Its straw attains a characteristic golden yellow tinge at maturity. Like *C250*, it is a weak-strawed variety, and is liable to lodge on rich lands. *C286* is always conspicuous in the field by its good stand.

C286 has been tested at the Gurdaspur Substation for the last five years against *C250* under normal-sown irrigated (average fertility), late-sown irrigated and *barani* (rain-fed) conditions. The normal-sown trials were laid out in the first fortnight of November and the late-sown ones in the third week of December.

It was seen that *C286* outyielded *C250* under all the three conditions each year, the average yield increase of *C286* being 1.42 maunds, 2.75 maunds and 1.73 maunds, per acre, respectively. The overall average excess in the yield of *C286* came to about two maunds of grain per acre.

The fact that *C286* has consistently outyielded *C250* clearly indicates that it possesses higher yielding potentialities than *C250*. As *C286* in addition possesses greater resistance to rusts and is earlier in maturity, it can easily replace the latter in the humid areas of the State.

In trials arranged on cultivators' fields during 1956-57 also, this variety gave a better performance than *C250*. In fact, this variety has already found great favour with the wheat growers of this tract. Steps have been taken to increase the supply of its pure seed to meet the heavy demand from farmers.

FOR LATE SOWINGS

C286 will be suitable for sowing under all conditions except rich lands in the submontane tract. Another quality of this variety is its ability to yield well under late-sown irrigated conditions throughout the State. At present, *C228* and *C281* are recommended for late sowings in the central and south-east Punjab, respectively. During the year 1956-57, when *C286* was tested against these two varieties at nine Departmental Farms throughout the State, it outyielded both *C228* and *C281* at each of the farms with an average margin of about three maunds of grain per acre. In addition to its being extremely suitable for the submontane region, it may safely be called the future wheat variety for cultivation in the entire State under late-sown irrigated conditions.

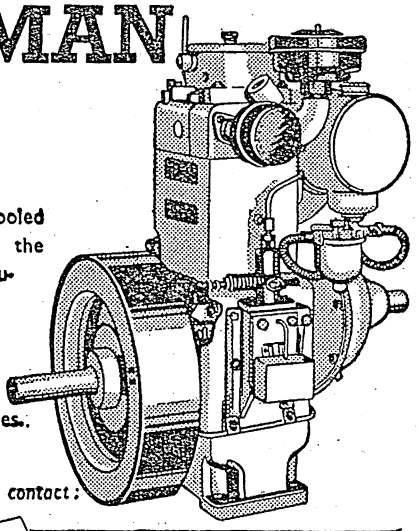
SUBMONTANE REGION

Even in the submontane region represented by Gurdaspur, the superiority of *C286* over *C250* was established under late-sown irrigated conditions as compared to normal sowings under irrigated and *barani* conditions. As the late-sown crop has a shorter growth period and is also more liable to rust attack, a variety suitable for late sowings must, necessarily, be early in maturity and preferably resistant to yellow and black rusts. *C286* amply fulfils these requirements and will, therefore, do particularly well where wheat has to be sown late after harvesting a *kharif* crop such as rice, as usually happens in the submontane region. For the same reasons, *C286* is also expected to do well under late-sown irrigated conditions in the rest of the Punjab where wheat follows cotton and other *kharif* crops.

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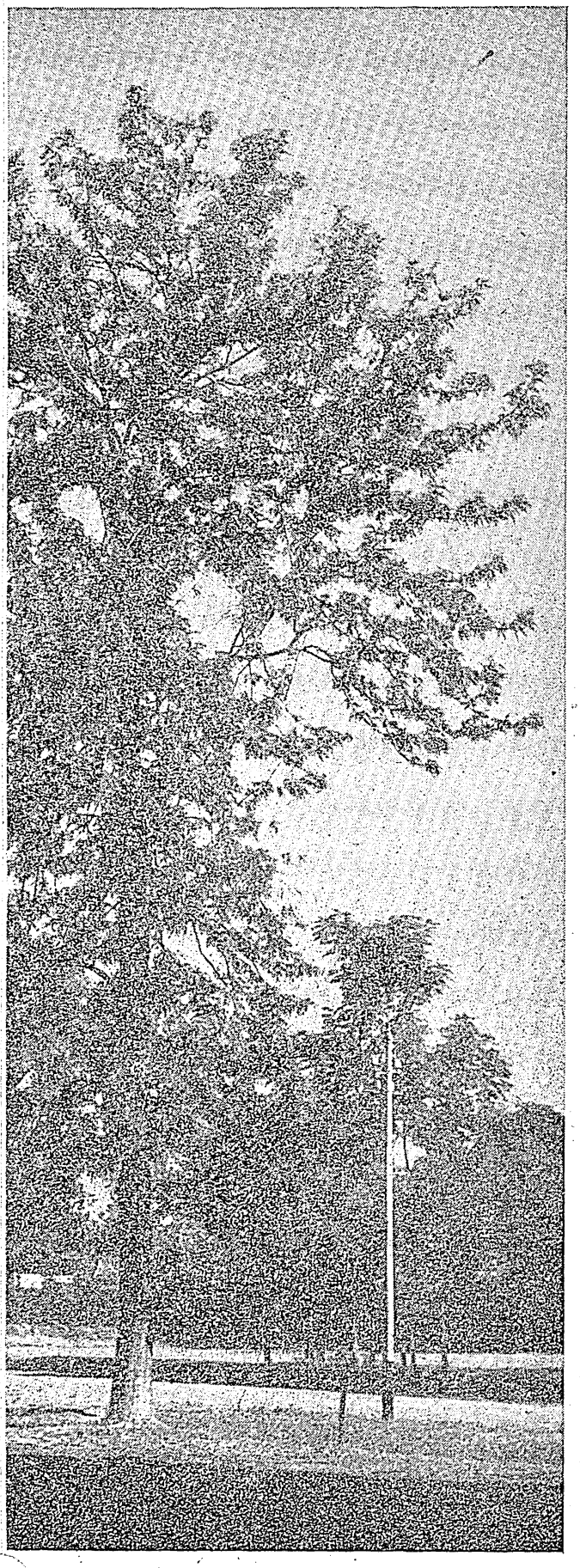


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This Australian silky oak grows at the Forest Research Institute, Dehra Dun



The Silky Oak

an ornament to any garden

by
M. D. Chaturvedi

HAILING from Australia (Queensland and New South Wales), the silky oak has found a welcome home throughout the Indian subcontinent.

It is generally cultivated as an ornamental tree in compounds of public and residential buildings, railway stations, parks and roadside avenues. The silky oak does not exhibit any preference for any particular type of soil. It is a tree of regions with moderate rainfall, and does not thrive in dry and arid tracts of Rajasthan and the Punjab.

The silky oak, otherwise known as Grevillea, is an evergreen tree of moderate size, attaining a fair height on well-drained, loamy soils. The stem is usually straight, and is covered with a dark grey and rough bark. Its crown, generally conical when young, begins to lose its graceful appearance with the passage of years. The leaves are six to 12 inches long; the tough leaflets are dark green above and silvery silky beneath, whence its name. The leaves have a fern-effect in general.

GOLDEN FLOWERS

Appearing in horizontal tiers on small, leafless twigs below the leaves, the crowded flowers have a rich old-gold colour. The fruits are small and yield one or two light, winged seeds weighing about 3,000 to an ounce. The flowers appear in April-May and the fruits ripen during the cold weather.

The tree is named as *Grevillea robusta*, after C.F. Greville, Vice-President of the Royal Society. Being an exotic, it has no local names.

The silky oak is not a long-lived tree. It loses its ornamental fern-effect after it reaches an age of 20 years, when it should be replaced. The tree is easily raised from seed. The seedlings can be easily transplanted. They grow very rapidly and furnish a shady shelter in a few years.

(*Contd. on page 10*)

Rust-resistant N.P. 200 *Wheat is a High-yielder Too!*

by

S. M. Sikka and V. K. Srinivasan

Indian Agricultural Research Institute
New Delhi

IT is strange, but true, that although only five per cent of the total wheat crop of the country is grown in the hills, this small area supplies all the inoculum of rusts to infect the crops in the plains. Cultivation of resistant varieties in this relatively small area, therefore, should go a long way in minimizing losses in the larger areas in the plains.

A SERIOUS MENACE

Rusts are a serious menace to the wheat crop wherever it is grown. In India alone, the average annual loss due to rusts was estimated to be of the order of 49 million rupees. However, when the rusts appear in an epidemic form, as in 1946-47 in peninsular India or, as in 1956 in Bihar and West Bengal, the losses are much more, often resulting in complete crop failures. The poineering work of Mehta in India has established that the hills are the main foci of infection. These foci are the Himalayan ranges in the north and the Western Ghats, Nilgiris and Palni hills in the south.

With a view to developing rust-resistant varieties, comprehensive co-ordinated work has been initiated by the Government of India, and a number of resistant varieties suited to different wheat-growing areas of the country have already been evolved. The Indian Agricultural Research Institute at New Delhi, which has its wheat breeding substations at Simla, Bhowali, Pusa and Indore, established a station at Wellington in the Nilgiri hills in 1954, with the object of evolving rust-resistant wheats for that area.

SOURCE OF INFECTION

This area in the south has a special significance in that although the area under the wheat crop here is relatively very low (about 4,000 acres only) it forms the focus of infection for about two million acres of the wheat crop grown in Mysore, Madras, Andhra Pradesh and the Bombay-Deccan. On account of the relatively cooler climate in the Nilgiri and Palni hills, all the three wheat rusts, viz., yellow, brown and black, are perpetuated the year round, thus forming a continuous source of inoculum for the crop in the plains.

The common cultivated species of wheat in this area is the emmer (*Triticum dicoccum*), generally referred to as *sambagodhumai* (Tamil), *Ravva godhumulu* (Telugu), *java godhumai* (Kannada) and *popatiya* (Gujerati), and which is generally preferred for the preparation of *uppumav*, a south Indian dish. Two crops are generally taken in a year, the first crop being sown in April-June and the second in October-November. The local *dicoccum* wheat which is unimproved, is attacked by the rusts, particularly the brown rust. As a result, its yield is very poor and the quality not very superior.

The Wellington Wheat Breeding Substation, mainly charged with the improvement of this species by producing rust-resistant strains has, after assessing the performance of a large number of *dicoccum* wheats, both Indian as well as foreign, for the last three years, selected a strain, *N.P. 200*, from the local wheat crop at Rishi Valley, Andhra Pradesh. The strain has proved superior to all the other *dicoccum* wheats tested so far.

DISTINGUISHING CHARACTERS

N.P. 200 is a fully awned wheat of medium height. It practically resembles the local in all its morphological characters. In maturity too, it is like the local, taking 110 to 120 days from sowing to harvesting. The most outstanding character of the variety is its high yield and resistance to brown rust, a character which readily distinguishes it from the local.

N.P. 200 possesses a higher grain-to-husk ratio —15 per cent more than that of the local *dicoccum* wheat; its 1,000-grain weight is 35 per cent higher. The grains are hard, bold and lustrous, and are very much superior to the grains of the local variety. It is very well suited for the preparation of *uppumav*. Its protein and gluten contents are 15 05 and 13 9 per cent, respectively, as compared to 11 5 and 10 6 per cent of the local. Thus, its nutritive value is far superior to that of the locally cultivated wheat.

HIGH YIELD

Results of trials conducted at the Substation and on farmers' fields at representative locations in the hills



of south India are given below.

At the Substation

Season	*Calculated yield in pounds per acre*		*Per cent increase over the local*
	Local	N.P. 200	
Kharif 1955	1,311	1,664	21
Rabi 1955-56	571	836	46
Kharif 1956	1,248	1,508	20·4
Rabi 1956-57	190	396	108
Kharif 1957	471	840	78

On farmers' fields

Location and season	*Calculated yield in pounds per acre*		*Per cent increase over the local*
	Local	N.P. 200	
Aruvankadu :			
Rabi 1956-57	2,496	2,666	7
Kotagiri :			
Rabi 1956-57	1,235	1,944	56
Deviculum :			
Rabi 1956-57	2,407	2,728	13

It is clear that *N.P. 200* consistently outyielded the local in all the seasons, on the Government farms as well as on farmers' fields. The rust-resistance of this strain is, therefore, fully reflected in its grain yield.

Taking into consideration all the factors, viz., the yield, rust-resistance, 1,000-grain weight, nutritive value and high grain-to-husk ratio of *N.P. 200*, this strain is recommended for cultivation in the Nilgiri and Palni hills. If farmers of these hills will take to this new strain in preference to the local, susceptible *sambha* wheat, they will not only be benefiting themselves, but will also help in reducing the inoculum of rusts for the wheat crop of the plains of peninsular India.

The seeds of *N.P. 200* are being multiplied at the Wheat Breeding Substation, Wellington, on a small scale. Enquiries regarding the availability of the seeds should be addressed to the Head of the Division of Botany, Indian Agricultural Research Institute, New Delhi-12, or to the Assistant Wheat Breeder, Wheat Breeding Substation, Wellington, Nilgiri hills.

THE SILKY OAK

(*Contd. from page 8*)

Natural regeneration of the silky oak is often met with in hedges and bushes close to the mother trees. The silky oak is commonly cultivated as a shade tree throughout Assam in tea plantations all over the Brahmaputra valley. It thrives in the Nilgiris up to 6,000 feet, and is planted as a shade tree in coffee plantations. The tree is very brittle, and is apt to be blown over in storms.

The silky oak is cultivated solely as a shade tree in tea and coffee plantations, and as an ornamental tree in parks and compounds. Its timber is not good even as firewood. In Australia, its timber is considered durable and exhibits pretty grain in radial sections.

PAN CROP PESTS AND DISEASES SHOULDN'T BE LEFT ALONE

by

B.G. Nikam,
C.N. Mahadik and
V.S. Rathore
Agricultural Research Institute
Gwalior

NO less than 45 lakhs of rupees are lost every year to Madhya Pradesh *pan* growers because of the pests and diseases that attack their crops. This large loss could be easily saved if the growers took timely control measures against these pests and diseases. Here are some of the important pests and diseases of *pan*.

DISEASES

Foot rot. This disease is caused by *Phytophthora parasitica* var. *piperina*. It is locally called *gudli* or *kata*. In its early stage, pallor and drooping of tender shoots and leaves are observed. Later on, the whole plant turns yellow and dries off. The roots and underground parts of the stem get rotted and destroyed.

The disease is both soil- and seed-borne, and is commonly observed during the rainy season. The following measures have proved quite effective in controlling this disease.

(i) Applying "Cupravit," "Perenox" (two to 2½ pounds in a 100 gallons of water) or Bordeaux Mixture (2 :2 :50) in *barejas*, before planting.

Repeat the treatment immediately after the vines have been lowered.

Give a third, fourth, fifth and sixth application at intervals of a month thereafter.

(ii) Giving a clean cultivation, and uprooting and destroying all diseased vines.

Leaf spots. This disease also is caused by the organism *Phytophthora parasitica* var. *piperina*, and is locally called *jalaka*. Circular, brownish, wet spots are first formed on the leaves. As the disease progresses, these spots increase with zonations. More than one spot may appear on a leaf. The affected leaf rots and ultimately falls on the ground.

The disease is prominent in the rainy season. The incidence of the disease is more in completely or partially mature leaves. Adopt the following methods for its control.

(i) Before planting, immerse the cuttings in Bordeaux Mixture (2 :2 :50), "Perenox" or "Cupravit"



Sclerotial bodies on a dead vine, as seen with a magnifying glass



A disease neglected means a crop lost

(two pounds in a 100 gallons of water) for an hour.

(ii) Look for diseased leaves and destroy them.

(iii) Spray the vines with Bordeaux Mixture (2 :2 :50) "Perenox" or "Cupravit" (two pounds in a 100 gallons of water) once every two months.

Powdery mildew (*Oidium* sp.). Locally, this disease is known as *lohiya* or *adula*. Small, whitish patches appear on the lower side of the leaves in the months of February, March and April. Gradually, these patches cover the entire leaf. As the disease advances, the infected leaves turn reddish in colour and start dropping. When the disease assumes a severe form, the whole garden is destroyed.

This disease is controlled by the application of finely powdered sulphur. In newly established gardens, say, three to six months old, a single dusting of sulphur at 25 to 30 pounds per acre, given about the middle of December, wards off the disease. In older plantations, two applications are needed ; the second application should be done about three weeks after the first.

Anthracnose. This disease is caused by *Gloeosporium* and *Colletotrichum* spp., and is known as *bidha* or *lafa* to the *pan* growers. It is easily recognized by the round and oval dark brown lesions on the stems of the vines. They increase under high humidity. Infected stems collapse and the vines ultimately die.

Destroy the affected vines by burning. Spray the vines in the affected gardens with a 2 :2 :50 Bordeaux Mixture, "Perenox" or "Cupravit" (1½ to two pounds in a 100 gallons of water). A gallon of the solution for 75 linear feet once every two months is sufficient to control the disease.

Sclerotial wilt. Locally, this disease is called *agya*. It is caused by *Sclerotium rolfsii*. The earliest symptom of this disease is the darkening of the stem at the foot of the plant near the ground level. Soon after, the leaves begin to droop and become flaccid, the shoots wilt and, in three or four days, the plant withers and dies.

Usually, three to four nodes and internodes are involved by the time the vine has died. The darkened part of the stem shrinks, becomes soft and sometimes slimy, and the colour ultimately becomes black. The epidermis may burst, exposing the rotten cortex and the fibres.

After the death of the vines, a tuft of white mycelium is observed on the dead portions of nodes and internodes just above the ground level, on which ultimately form small, brownish, rounded bodies (sclerotial bodies).

When the disease assumes an epidemic form, the soil in *pan* gardens is also found covered with these sclerotial bodies.

Control measures are not yet known.

Rhizoctonia wilt. Called *gandhi* or *gindali* by the local people, it is a very bad disease of *pan* gardens. It occurs singly or in combination with sclerotial wilt. The upper portions of the affected vines turn brown and wither, while the stem at the ground level blackens. In the early stages of the infection, a reddish brown discolouration appears on the stem, spreading slowly and causing it to collapse. The roots are also found blackened. Later, the stems near the ground level are coated with a white layer of mycelium. The affected vines wither and die.

Control measures have not yet been found out.

Verticillium wilt. Locally, this disease is called *kala dhaga* (black thread). The noticeable symptoms of this disease are drooping of the growing top and withering of the leaves which dry and drop down gradually. The vine ultimately dies. When a freshly wilted vine is split open, a black thread-like discolouration is noticed throughout.

Definite control is not known.

Other fungi frequently found on the dead parts of the stem are species of *Fusarium*, *Cephalosporium*, *Aspergillus*, *Rhizopus* and *Alternaria*, along with certain species of bacteria, but all of these are saprophytic. Nematodes are often found in or on the soft rotted tissues of the dead vines in association with these fungi.

PESTS

The *pan* crop is infested by insects, particularly mealy bugs and aphids, mites, etc. Among these injurious pests, the mealy bugs outrank others in causing damage to the crop.

Mealy bugs. They are locally called *missi* or *gaghai*. In Madhya Pradesh, they inflict heavy losses on *pan* gardens at some places, especially at Bhanpura (District Mandsaur).

Mealy bugs are small-sized (about five millimetres long) insects with a soft, oval, brownish white body. As a rule, they bear suctorial type of mouth parts. They are found feeding on the underside of the leaves. The bugs have two longitudinal parallel dark lines on their dorsal side and also possess two long anal cerci. The female bugs lay many white-coloured eggs *en masse* on the lower surface of the leaves. The eggs hatch out in a few days into small whitish nymphs which later transform into adults.

These coccids are active from the month of April to July. Both the nymphal and adult stadia damage the crop by sucking the sap of the leaves. Consequently, the leaves fade in colour and give the appearance of green mottled with yellow. The leaves are fully covered with the white webs due to these bugs, and their texture as well roughens. The leaves ultimately dry and fall off from the vines.

Thus, leaves attacked by mealy bugs have no market value, for they are rendered unfit for human consumption. Since the *pan* is a leafy crop, such damage by mealy bugs proves an enormous loss to *pan* cultivators.

It has been observed that mealy bugs are destroyed naturally due to heavy rains. *Pan* growers sprinkle wood ash on the leaves to check them. Contact insecticides like strong tobacco decoction, nicotine sulphate and fish-oil rosin soap, kill them, but the nicotine imparts a tobacco odour to the leaves.

However, mealy bugs can be effectively controlled by treating *pan* gardens with a 0.04 per cent "Folidol" spray at the rate of a 100 gallons per acre, twice at an interval of 15 days.

Aphids. They are locally called *mau*. They are green-coloured small-sized insects occurring in congregations on the underside of the leaves. Both the nymphs and adults suck the juice of the leaves. They are killed by a 0.04 per cent "Folidol" spray.

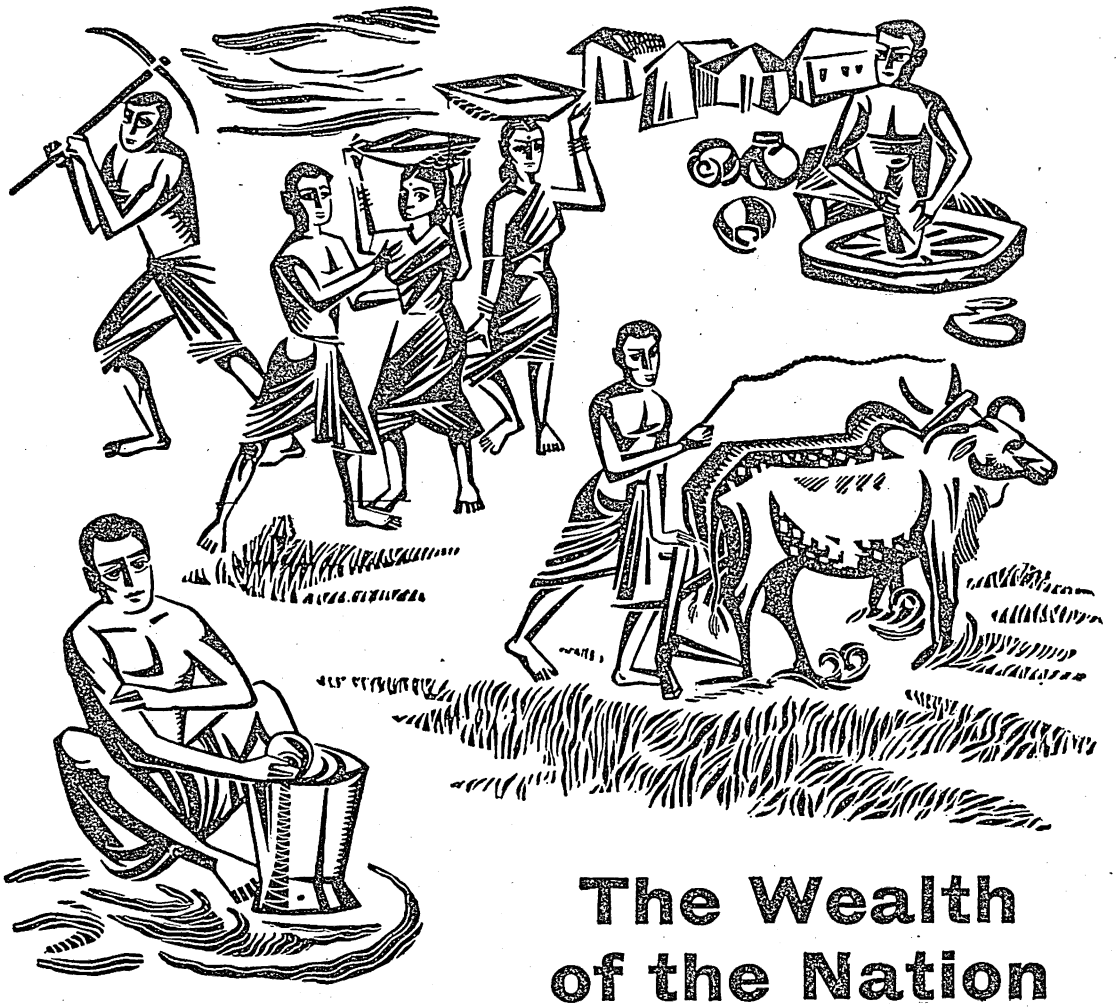
Mites. They are locally known as *gauri*. Mites are very small-sized, yellowish brown pests of the *pan*. The eggs are white, round and transparent, and the young ones are red in colour. Damage is done by them by desaping the leaves, which show a black appearance due to their excreta. This pest can be controlled by lime-sulphur wash at the rate of ten pounds per acre.

PLEASE CORRECT

In the article "Fertilize—with what and how much of it ?" by P.C. Raheja, in the February, 1958, issue of *Indian Farming*, on page 23 (col. 1, line 3 from below), the nitrogenous food content of a two-hundredweight bag of ammonium sulphate is wrongly stated as four pounds ; it should be 46 pounds



Timely control of pests and diseases ensures a good *pan* crop



The Wealth of the Nation

Tough, hard-working hands — hands that plough and sow and reap — farm-workers' hands: their skill and their toil produce the wealth of the nation. How vital therefore to protect their health.

And yet, because a farm-worker cannot avoid dirt while working, he daily runs the risk of disease and ill-health through infection from the germs that all dirt contains. For this reason alone it is important that self-help programmes in our villages should always point out the value of *self-help* in personal health and hygiene.

The villager who learns for himself and teaches his family the hygienic necessity of washing regularly with a good soap — and particularly with LIFEBUOY SOAP because it washes away the germs in dirt — is doing very much more than acquiring a healthy habit: he is helping to protect the nation's health and wealth.

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YOU CAN MAKE EGGS

HOLD ON LONGER

by
S. Bose
Indian Veterinary Research Institute
Izatnagar

ONE out of every four eggs produced in India, it is estimated, does not reach the consumer in good condition. It either becomes stale, develops an embryo or mould, or gets cracked and thereby contaminated.

Considering our meagre total egg production—just four million eggs daily for 357 million people, this is a substantial loss. The most important single factor responsible for this is our tropical climate. Hence, eggs must be protected against high temperature from the time they are laid till they are finally disposed of.

Most eggs are of good quality when laid, and should remain so if properly handled thereafter. It must, however, be borne in mind that once an egg loses in quality no process of preservation can revive it.

First of all, eggs produced should be kept clean. The birds should be properly housed, and nests provided for laying-hens. Eggs which get dirty can be wiped with a one per cent solution of sodium hydroxide.

Eggs should be gathered frequently during the hot weather, at least four times daily. Immediately after gathering them they should be placed in a wire-mesh cabinet in a room where the temperature has been maintained at about 16°C and relative humidity at 75 per cent. If eggs are to be stored in an ordinary room, water should be sprinkled over the floor and wet Hessian hung over doors and windows which should be kept open.

Hessian saturated with water from a drip-pan may also be hung round the egg cabinet. A few lumps of copper sulphate added to the water would prevent mould development on the Hessian or on any other part of the egg cabinet.

COLD STORAGE

In Western countries, egg quality is fairly well maintained for about nine months in cold storage at 0°C and relative humidity 85 per cent. The air cell which is a recognized commercial index of quality, however, gets enlarged as storage proceeds.

Gas storage of eggs consists in storing eggs at 0°C in air containing not less than 60 per cent of carbon dioxide. Since this concentration of carbon dioxide is sufficient to prevent growth of moulds or bacteria, the atmosphere can be saturated (a 100 per cent relative humidity), so that there is no increase in the size of the air cell.

In India, however, cold storage of eggs would be possible only when better refrigeration facilities become available.

PROCESSING OF EGGS

One of the major causes of egg spoilage in India is the embryo development in fertile eggs, particularly during summer. Due to high temperature, eggs become inedible owing to the embryo growth after about two days. Although infertile eggs remain edible much longer even under adverse conditions, production of infertile eggs is a difficult problem under the present system of poultry-keeping in India.

Experiments carried out at the Indian Veterinary Research Institute, Izatnagar, have shown that egg spoilage during the summer months can be prevented by heat-treating eggs in water for 15 minutes. Eggs are placed in wire-baskets and immersed in a well-stirred water-bath. The temperature of the water-bath is maintained at 54.5°C. This is a very convenient temperature for heat-treatment of eggs, as there is no danger of the albumen or yolk coagulating.

Heat-treating improves the storage life of eggs by

(a) killing many of the bacteria, if present on the shell and in the egg white,

(b) killing the embryo and

(c) stabilizing the condition of the thick white and the yolk.

Heat-treated eggs kept at room temperature at 34°C remain edible for 14 days, and are only slightly inferior to day-old eggs. On the other hand, untreated eggs become inedible due to embryo development with blood formation.

The keeping quality of eggs can be further improved by lime-sealing or oiling the heat-treated eggs. The lime or oil closes the shell pores, and thus prevents evaporation of moisture and the normally occurring carbon dioxide from the egg. Lime-sealing, however, should be done as an adjunct to heat-treatment and should not replace it.

Lime-sealing is done by soaking eggs in lime-water for about 18 hours. Lime-water is prepared this way. A pound of quicklime is put in a container and a pint of boiling water is added to it carefully. The fluid is then allowed to come down to room temperature.

Then, 4½ pints of cold water and four ounces of powdered salt are added to it and the solution is stirred. The solution is then strained, and the clear fluid poured over the eggs to be preserved. Prior to preservation, the eggs are kept in lime-water for 18 hours.

Oil-coating of eggs, suggested as early as 1807 by the Dutch, has proved to be an economical method and is widely used. Oiling consists in dipping the eggs for half a minute in an egg-processing oil kept at room temperature.

An egg-processing oil must prevent evaporation and loss of carbon dioxide by sealing the pores of the shell without imparting any odour, colour or flavour to the egg. The oil most commonly used in the U.S.A. is the carnation oil. It is a white mineral oil refined from paraffin base. As this oil is not available in India, coconut oil has been used in its place with fair success.

If eggs are properly processed by these two methods before they are sent to distant markets, egg spoilage would be considerably reduced.

FREEZING OF EGGS

Freezing of eggs is another method of maintaining egg quality. Frozen eggs may consist of a mixture of whites and yolks in natural proportions or whites and yolks frozen separately.

Egg-contents are usually frozen and held at −20°C or a lower temperature. A 30-pound container of liquid eggs held in freezer at −20°C generally freezes in about 72 hours. Air blast freezing and specially constructed quick-freezing units may be used to get a much more rapid freeze.

The frozen egg industry can be built up successfully near large producing areas in India for utilizing small-sized or cracked eggs which are otherwise difficult to market.

EGG-DRYING

Compared with preserving the egg in the shell or in liquid form, removal of water from the egg is considered a more satisfactory method. The commercial method of egg-drying has been perfected and widely employed in Western countries.

The egg pulp is forced under pressure into the drying chamber and sprayed from a nozzle. The entering air has a temperature of about 127°C while the exhaust air has a temperature of 50°C. Although the air is hot, due to the quick evaporation of water, each particle of the dry powder cools down as soon as it is produced.

Under the influence of the heat, the carbonic acid and other volatile organic acids are lost while their salts, such as bicarbonate, break down, releasing more carbonic acid, thus lowering the acidity of the substance.

A great change in the acidity is usually accompanied by a lessening of the restorability of the product and indicates an unsatisfactory drying procedure. The final moisture content of the product should be about six per cent.

Although spray-drying has not yet been employed in India, dehydration of eggs by pan-drying is being practised in certain areas. Pan-drying equipment of a small capacity can be used quite profitably. The proper thickness of the layer in the drying pans is 0.6 centimetre. The temperature during the period of evaporation can vary between 40° and 50°C. The drying process must be continued till the moisture content of the product has been reduced to six per cent.

The product obtained by spray-drying is usually a fine powder, while the product of pan-drying is made up of flakes or scales which can be ground into a powder. Storage of the product, either loose or compressed, in wax-fibre cartons at room temperature for a prolonged length of time results in off-flavours, losses in solubility and destruction of vitamins A and B. Recent experiments have, however, shown that dried eggs sealed in tin cans with carbon dioxide gas improve in keeping quality regardless of the storage temperature.

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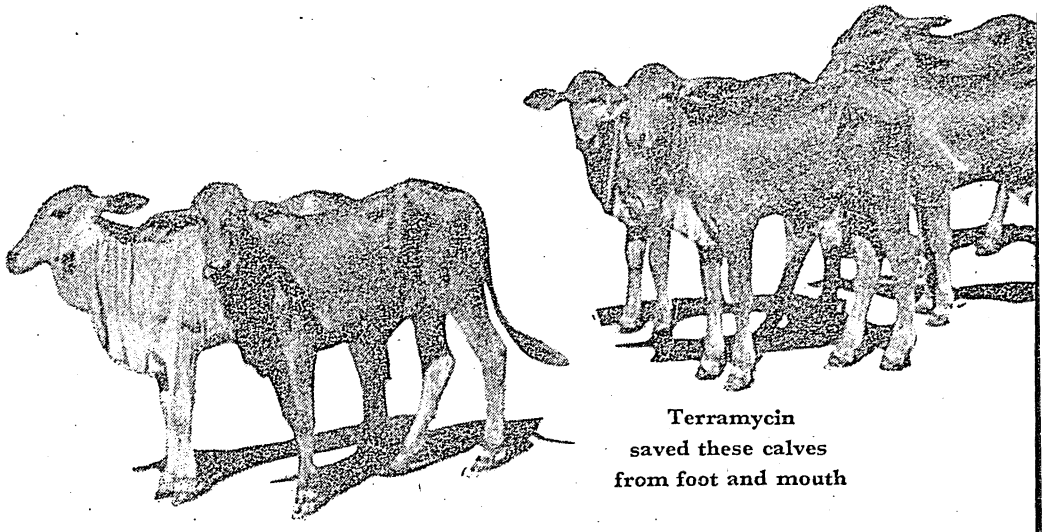
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Research Note



Terramycin saved these calves from foot and mouth

Terramycin may well be the Answer to Foot and Mouth

by

Gian Singh
and
Gurcharan Singh

Indian Agricultural Research Institute
New Delhi

USE of "Terramycin"—perhaps for the first time in India in the treatment of the foot and mouth trouble of cattle, has given quite encouraging results at the Indian Agricultural Research Institute, New Delhi.

Foot and mouth is a highly contagious and infectious disease of cloven-footed animals, and is caused by a filterable virus which is the smallest of all the known viruses. The virus occurs in three types, called Valle "O" and "A" and Waldmann "C." The virus is highly susceptible to mutation.

DEBILITATING EFFECTS

Foot and mouth is endemic in India, and causes heavy losses every year. Generally, the mortality is very low, and that too is in young calves. However, the seriousness of the disease lies in its debilitating effect on the general health of the animals which results in a fall in milk yield, permanent disability in one or the other form such as lameness and panting, decreased breeding capacity and prolonged heat periods, loss in working capacity of bullocks, etc. The total annual economic loss thus suffered by the country is estimated to be four crores of rupees.

The disease commonly occurs in a mild form. There is, however, a malignant form also in which the course is more rapid and the loss of life much more. This is due to the direct action of the virus on the heart muscles, especially in sucklings and young animals.

In malignant outbreaks, as many as 50 per cent of the affected animals either succumb to the disease, or are so seriously affected that they become useless. In foreign countries, very little attempt is made to treat the affected animals, and they are slaughtered. But such a control measure is out of question and impracticable in India, as the outbreaks occur very frequently. Moreover, there is a religious prejudice against slaughtering of animals. Every attention has, therefore, to be devoted to its preventive and curative treatments.

AT THE I. A. R. I.

The foot and mouth disease that broke out last March at the I.A.R.I., was of a malignant nature. The whole Sahiwal herd consisting of about 90 animals, 15 buffalo stock and 65 bullocks got infected at small intervals.

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* * *

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BAYER

The disease started with the sudden death of a suckling on 7th March, followed by the appearance of the typical symptoms of foot and mouth in the whole herd a day later. Necessary steps were taken to check the di ease immediately. Footbaths were dug and the premises were thoroughly disinfected. Apthisation was also resorted to. Routine mouth-washes and antiseptic dressing of feet lesions were simultaneously taken up. Every effort was made to feed the animals with soft feeds, including boiled barley and skim milk.

A couple of days later, another group of animals, four sucklings and three heifers, died suddenly in a similar manner. There were six more deaths of sucklings running a course of one to three days and showing symptoms of the severe character of the disease consisting of high temperature, great prostration, fast pulse rate and rapid respiration which rendered the sucklings incapable of rising, death occurring in a short time.

The disease in adult animals, both in cows and bullocks, was also severe in nature, causing big wounds in the feet and extensive ulceration of the mouths. The course of the outbreak ran for about four weeks. The post-mortem examination revealed myocarditis, myodegeneration, flabby heart and gastro-enteritis.

TREATMENT GIVEN

The adults were given the usual treatment of washing the mouth with potassium permanganate and alum lotion, dressing the feet lesions with copper sulphate and phenyle lotion and administration of tonic mixtures internally. "Sulphamezathine" 33⅓ per cent, was administered subcutaneously and was found to provide quick relief amongst the adults who were very seriously affected by this malady. The animals were very much prostrated and could not move about; the temperature was 104°F and the animals were completely off feed. A full course of "Sulphamezathine" 33⅓ per cent S/C cured the animals rapidly and the animals recovered completely within a fortnight. This drug has been used very frequently in India at various other places in adult animals.

The infected sucklings were also given "Sulphamezathine" in order to improve their respiratory distress, but with no response. "Cardizol," a heart stimulant, was also administered to the calves, but there was little success.

In another young male, "Sulphamezathine" was first tried followed by several other medicines, including penicillin, but the animal did not improve and the rate of respiration remained high and the condition of the animal got worse.

TERRAMYCIN TRIALS

Then, "Terramycin" 100 mgs. "intramuscular" (animal formula) was tried on this animal perhaps for the first time in field trials in India. Within eight to twelve hours, the respiration improved. The next day, another injection of "Terramycin" 100 mgs. was given, which definitely showed further improvement. After the second injection, the animal became brighter and started eating a little green fodder. The animal was

(*Contd. on next page*)

Sesbania Scores Again!

by

K. Rajagopalan
Rice Research Assistant
Agricultural Research Station
Rudrur

and

M. S. Pawar
Paddy Specialist
Hyderabad

RICE farmers in the Telangana area of Andhra Pradesh are green manure-minded. Sannhemp, *pillipesara* and *dhaincha* are the common green manure crops they grow.

In Nizamabad district, in Telangana, rice is mainly grown in the two seasons of *abi* (monsoon rice) from May-June to December, and *tabi* (summer rice) from January to April-May. Farmers successfully grow a green manure crop in April-June, between the *tabi* and *abi* seasons, for manuring the *abi* crop. But, the green manure crop does not grow in the cold weather of November-January, and as such they are not able to grow any green manure for the *tabi* crop.

A TRIAL

In 1954-55, *Sesbania speciosa*—the green manure crop of Madras State, was tried at the Agricultural Research Station, Rudrur, with a view to finding out whether it would succeed where sannhemp, *pillipesara* and *dhaincha* had failed.

At the Station, where the soil is sandy loam, experimental plots were ploughed thoroughly and fertilized with superphosphate at 15 pounds of phosphoric acid per acre. On these plots, *Sesbania* was tried in comparison with sannhemp. For *Sesbania*, a seed-rate of 25 pounds per acre and for sannhemp of 60 pounds per acre, was used. The two crops were sown in September.

While both the crops germinated, it was found that the sannhemp seedlings started dying when the rains began. With about five inches of rainfall in September, the crop was completely wiped out. On the other hand, *Sesbania* withstood a heavy downpour of nearly 14 inches of rain, showing that it could stand water-logging to some extent.

Growth of *Sesbania* was slow till November end, when it was only about two to three feet. By mid-December, it began growing rapidly, and was five to six feet high by mid-January. In the first week of January, it had started flowering, and by the middle of January, or 129 days from the date of sowing, was in complete flower. In the third week of January, the crop was cut and applied to the adjacent plots.

GOOD SUCCESS

The *Sesbania* crop yielded a green leaf of 17,020 pounds per acre, sufficient for application to three to four acres at 20 to 30 pounds of nitrogen per acre. This meant that half the nitrogen requirements of the *tabi* crop could be met with this green manure. The usual dose of nitrogen recommended for the tract is 45 to 60 pounds.

Sesbania was again tried the next year (1955-56), and grown in the same way as previous year. That year again, it gave an acre-yield of 17,430 pounds per acre.

In both the years, the crop was free of insect pests, unlike the other green manure crops grown in the area. The two-year experiment clearly shows that *Sesbania* can be grown with success as a green manure crop for the *tabi* season, where an early rice crop is taken during the *abi* season.

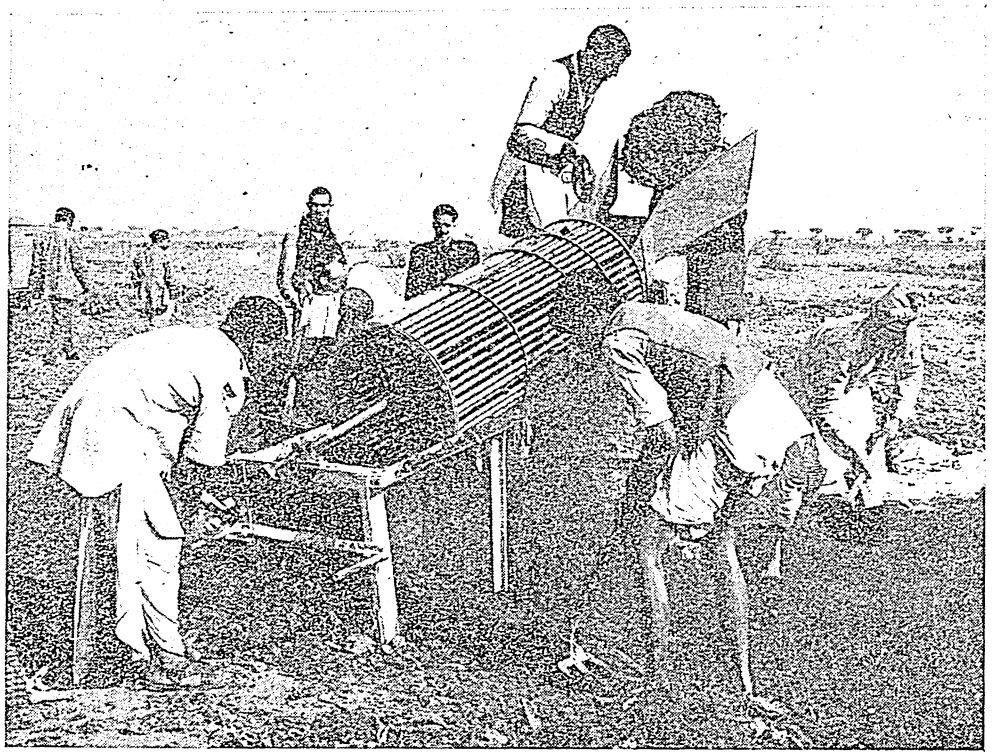
TERRAMYCIN FOR FOOT AND MOUTH

(*Contd. from previous page*)

given spirit ammonia aromatica both morning and evening. In addition, tonic electuary was given to tone up the digestive system.

"Terramycin" (intramuscular) was further used in three similar serious cases in calves and gave quite satisfactory results, and the calves subsequently recovered. "Terramycin" was also used in another group of three calves, exposed to infection, at the rate of about 30 mgs., and it proved effective as a preventive too.

The severity and malignant nature of the disease can be attributed to a longer interval between the present and the past (1954), outbreaks. A similar explanation of malignant outbreaks is given by Winkel (Hutyra, Marek and Manninger, 1946) who points out, "These are only observed when a long interval has elapsed since the last epizootic." It needs a good deal of further research.



MORE AND BETTER MANURE

The Night-soil Compost Scheme, recently introduced in a number of states, has, as its target, increasing compost production in the country to 2.4 million tons. Five hundred and thirty compost inspectors have already completed their training and will, in turn, train farmers in better methods of compost-making. Photo shows a rotary sieve being used in a village to rid the compost of foreign materials

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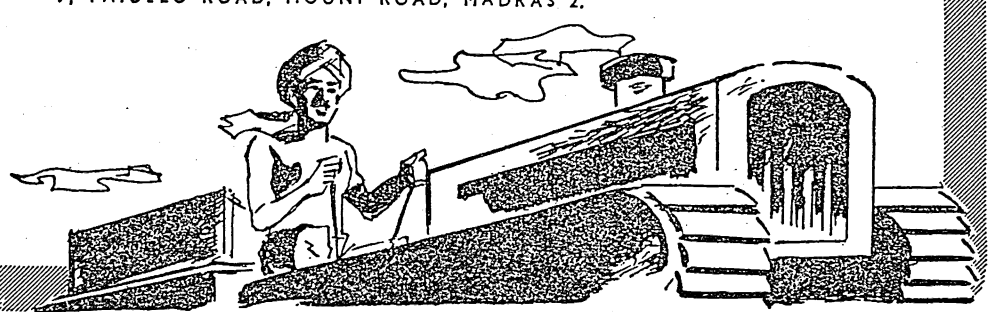
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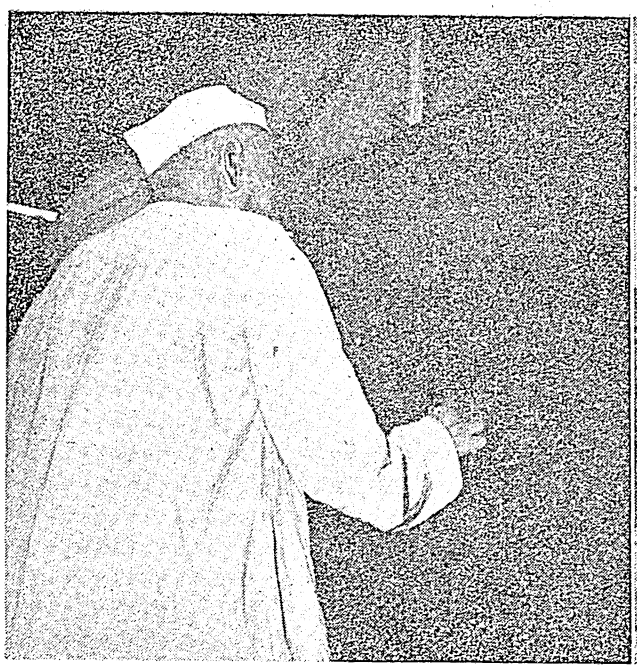
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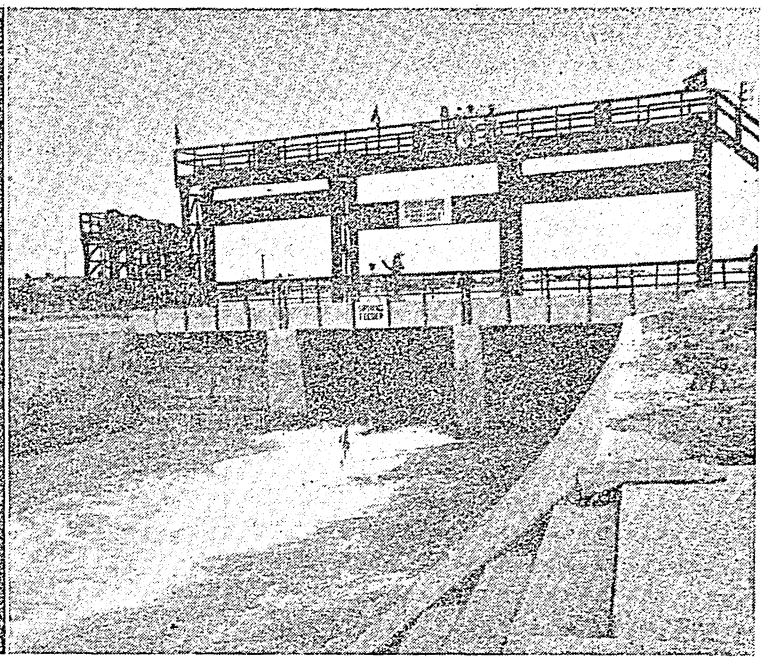
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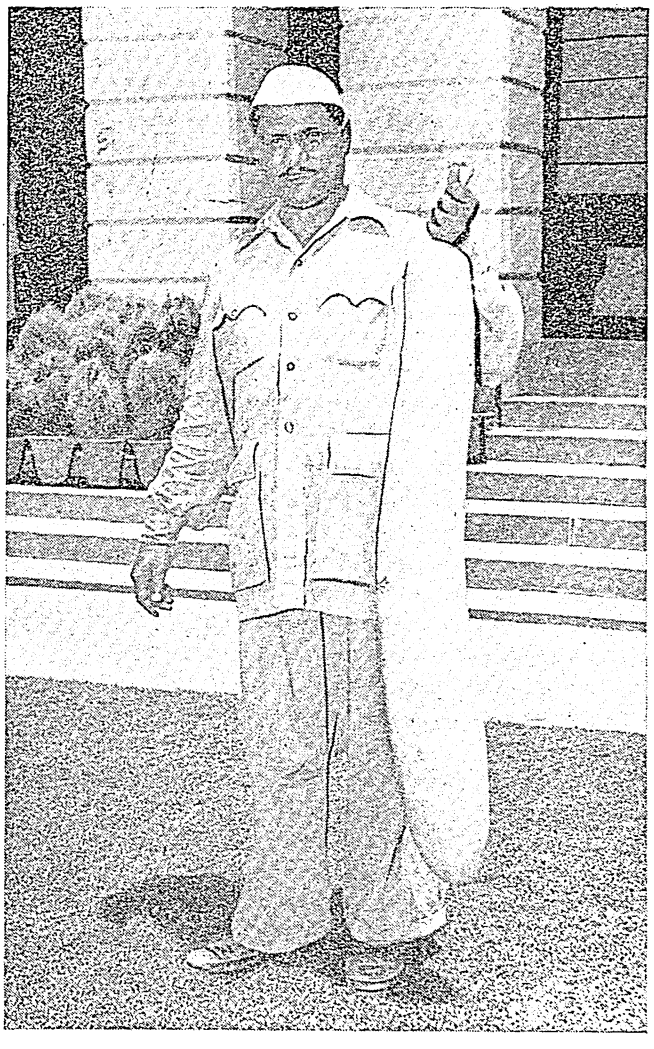




BOON FOR THE FARMER

July 1, 1958, and Punjab and Rajasthan farmers rejoiced to hear of the opening of the Sirhind Feeder Canal, which will ultimately stretch to 89 miles, and will irrigate ten lakh acres in the Punjab and seven lakh acres in Rajasthan. The opening ceremony was performed by the Union Home Minister, Pandit Govind Ballabh Pant (*above*)

NEWS AND PICTURES



PRIME MINISTER'S VEGETABLE GARDEN

If flowers adorn the spacious lawns of the Prime Minister's House in New Delhi, vegetables occupy the cosy corners of the Estate. Picture shows a *lauki*—45 inches in length, 19 inches in girth and 23 pounds in weight—harvested from the current crop

WHY RICE YIELDS HIGH IN RUSSIA

by

Pak Chen Ir

I HAVE been heading one of the rice-growing teams of our collective farm ever since 1940. In the first few years, my team harvested from 2.2 to 2.6 tons of rice per hectare (about 2.5 acres) on a 20-hectare plot assigned to us. Later, we succeeded in increasing our yield gradually from year to year.

In 1954, we harvested four tons of rice per hectare on a 50-hectare plot, and, in 1955, the average yield had already reached 5.7 tons on the same plot, 25 hectares of which yielded eight tons per hectare.

FAVOURABLE CLIMATE

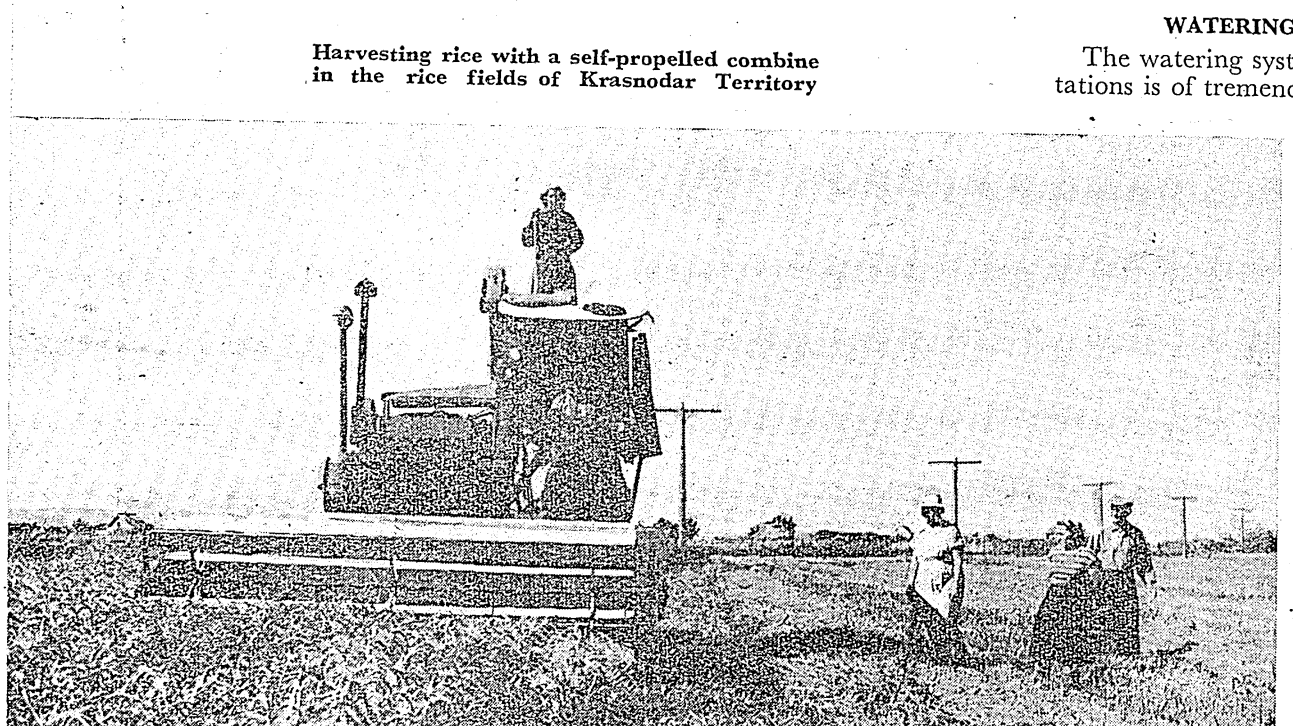
The climatic conditions of our region are favourable to rice cultivation. The warmth of the season, the abundance of light, the rich source of irrigation (the Syr-Darya River) and the absence of rain in summer and, especially in autumn, all contribute to the ripening of even such rice varieties as have a vegetation period of 120 to 140 days.

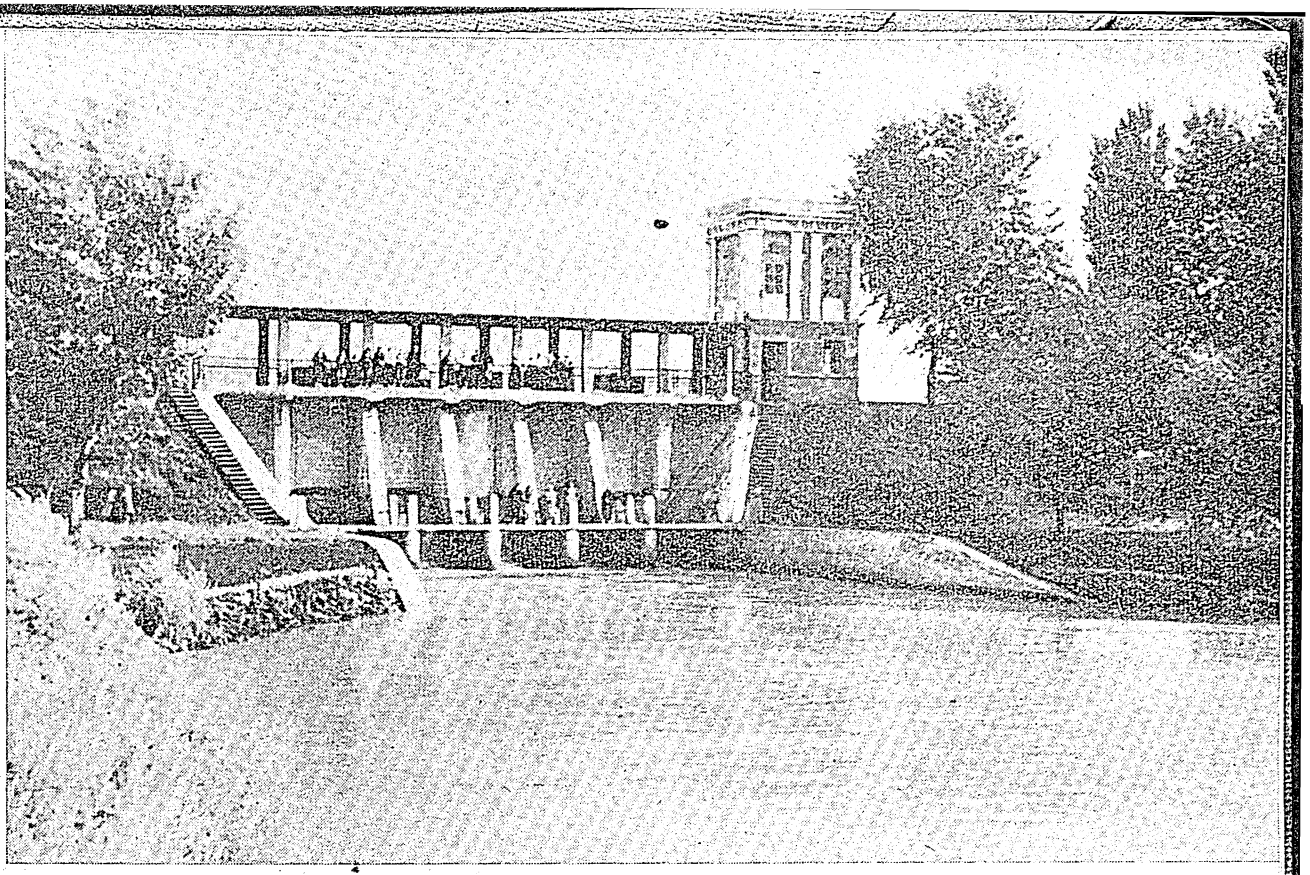
We concentrate on enhancing the yield the year round. Special attention is given to seed quality. We use only selected seed. Great attention is also given to weeding the graded seed plots, and, in the winter, the seeds are hand-picked. Before storing the seed, we put it through grain-cleaning machines and dry it thoroughly. Good seeds invariably yield vigorous sprouts that withstand diseases, pests and other unfavourable conditions much better.

WATERING SYSTEM

The watering system on rice plantations is of tremendous importance.

Harvesting rice with a self-propelled combine in the rice fields of Krasnodar Territory





The starting of the Kuban rice irrigation point network

After planting, we moisten the soil, and do not overflow it until the shoots have fully sprouted. When the third blade appears, we increase the water level gradually, and when the crop attains the shooting phase, this level reaches ten to 12 centimetres and is maintained so up to the complete ripening of the crop.

The waste water diverted from the rice-checks into the levees does not exceed five per cent of the water used for overflowing the rice-checks.

In order to provide an even layer of water on the sown area, we level the fields thoroughly every year. The differences in the evenness of the checks, after levelling, do not exceed three centimetres. This work is carried out by hand—first on dry soil and then in the water.

GOOD TILLAGE

We plough the rice lands no less than 25 centimetres deep every autumn. Prior to planting, the soil is worked carefully two to four times with diesel cultivators and harrows in hitch, to a considerable depth. All this, as well as harvesting, threshing and cleaning of the seed grain, cleaning of the irrigation network and the trunk canals, is done by the machine and tractor station. Immediately before planting, the soil is again loosened thoroughly with disc and zigzag harrows. We begin rice planting no later than two days after the last cultivation. Experience has shown that when the land is ploughed deeply and cultivated thoroughly, the problem of coping with reeds and other weeds is practically eliminated.

In 1955, my team planted a five-hectare experimental plot with a new Soviet variety of rice known as *Dubovsky-129*. The experimental plot was given the same attention as the other varieties under cultivation. The section planted with *Dubovsky-129* yielded a better harvest than those sown with the *Karatansky 86/79* variety. Besides, *Dubovsky-129* lodged less than the others. That is why we intend to pass over to the new and more productive variety in the next few years.

MACHINE-SOWING

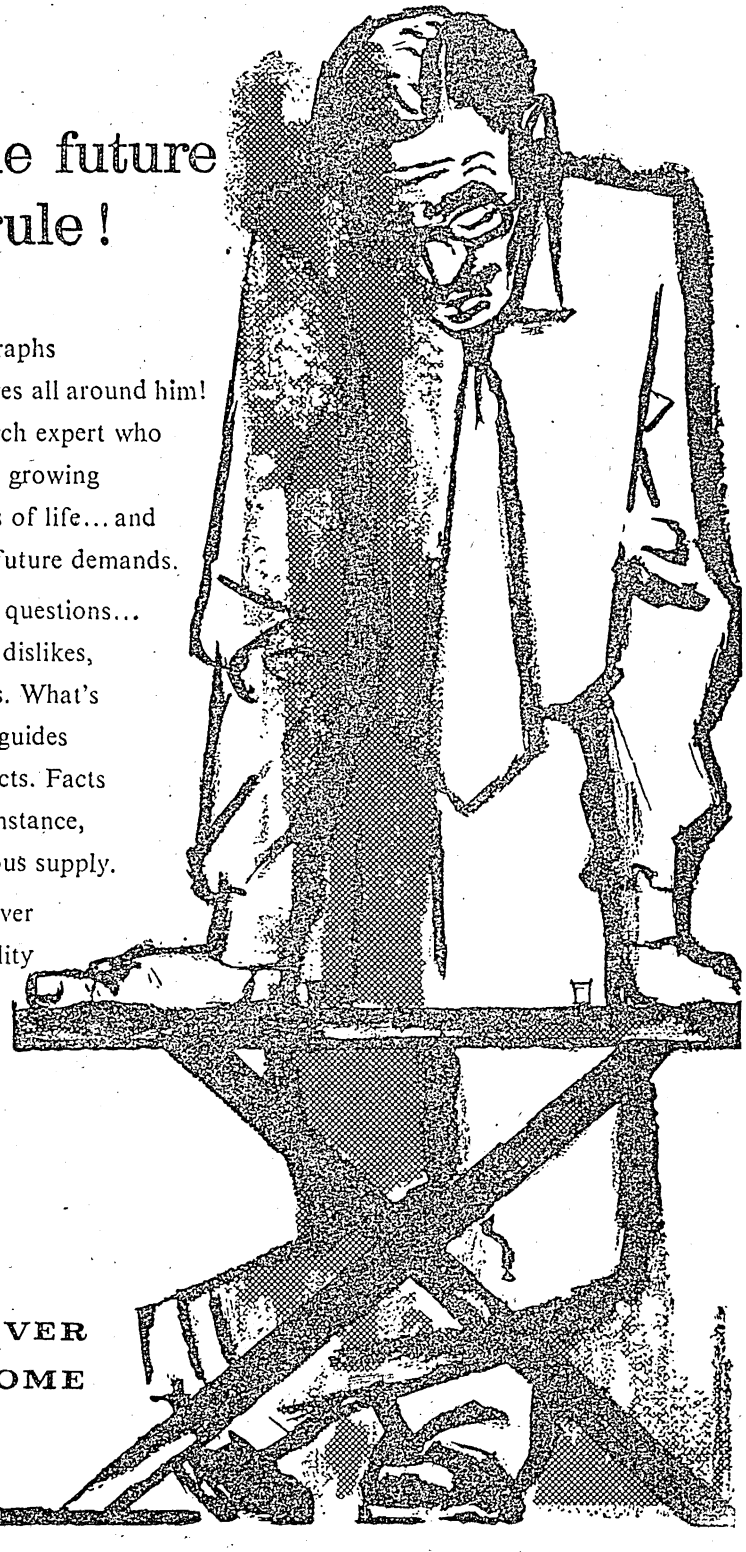
Rice is planted on our plot, as well as the plots of the other teams in the collective farm, with tractor-drawn seeders. As compared with the hand method, the machines distribute the seeds more evenly on the fields, and at the required depth of 1.5 to two centimetres. This leads to faster germination and facilitates development of the shoots; it also increases their resistance to lodging. Besides, seed-drills do the job much faster and require much less labour expenditure, which is very important for us because of insufficient manpower on our collective farm. Experience has shown that the yield increases considerably when rice is planted with seed-drills instead of by the hand method. In the past three years, we have planted 160 kilograms of rice seed per hectare, which produce from five to six hundred plants per square meter. Thus, with this norm of sowing, along with observation of all the necessary agronomic measures, the per-hectare yield is anywhere from eight to ten tons.

RESPONSIBLE TASK

Irrigation during the vegetation period is quite a responsible task. For the past ten years, this work has been carried out in our team by the experienced Fyodor Kim. He looks after the normal flow of water from one check to another. This explains why alga is eliminated from our fields, which, if not prevented, lowers rice harvests greatly.

(*Contd. on page 35*)

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grazing by rotation is grazing the right way

by

H. C. Malik

Assistant Economic Botanist (Fodder), Punjab, Sirsa

IN the Punjab, natural pastures found in the plains or on the hills provide more than two-thirds of fodder for the livestock. Livestock-rearing is a more important industry on the hills than in the plains.

In spite of their great use, however, pastures are very much neglected in the State. Today, pastures are to be found on unculturable wastes or places which are not suitable for tillage operations. The most rugged and steepy lands on the hills are reserved as grazing areas. Even then, they generally provide plenty of feed during the rainy season of July to September-October. When the rains stop and the winter sets in, however, the grasses dry up and the pastures cease to provide any more grazing.

With the first sprouts of grass coming up with the shower of rain, livestock are immediately back to pastures, as they have remained without much natural feed for more than half the year. In fact, the livestock are never, so to say, off the pastures, but continue to be on them though they may not provide anything for grazing. As a result of such indiscriminate grazing, the superior young grasses that sprout with the first rain are not given much of a chance to grow, and provide but a limited amount of fodder. Even the coarse grasses are grazed and left out in patches.

Along with the increase in livestock population, the area under natural pastures has been decreasing with increased pressure on land for growing enough food to meet the human needs.

How can the existing pastures be improved? Experiments are in progress in this direction at the Hill Grasses Research Station, Palampur, Punjab. One of the projects taken for study is the effect of cutting grasses at varying intervals to stimulate rotational grazing.

HARMFUL PRACTICE

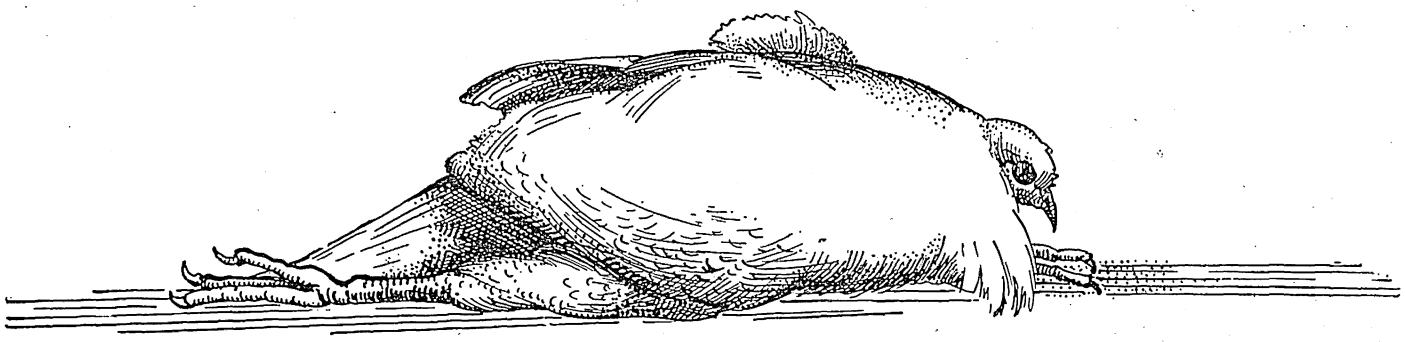
Allowing the livestock to graze indiscriminately on the entire grazing area as one unit is a harmful practice. Allowing the livestock throughout the pasture this way results in waste due to trampling and spotty grazing. Hence, to increase the efficiency of the pasture and to avoid irregular grazing, the grazing area should be divided into convenient three to four parts and each grazed separately in rotation. This rotational grazing enables grasses to sprout uniformly and recover fully before the livestock come in again.

For the experiment at Palampur, *Chrysopogon montanus* (*dhoulu*), one of the valuable grasses of the area, was used. This grass is found on stony inhospitable soils with little capacity for holding water; but, it is fairly nutritious. The experiment consisted in cutting the newly-sown grass at intervals of 20, 30 and 40 days during the rainy season, to imitate livestock grazing on the grass at these intervals. The grass was sown in 1951. It germinated well and made fairly good growth. The forage was cut uniformly at first and later on according to the schedule given. The experiment was conducted for three years. The forage yield and the number of cuttings made are given below.

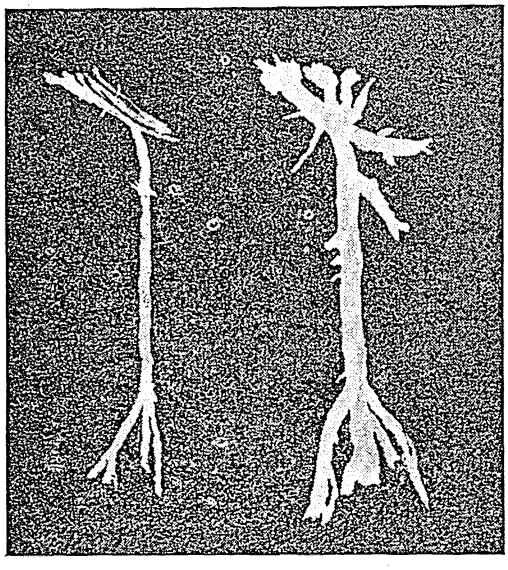
Treatment	*Year*	*Number of cuttings*	*Forage yield per acre in maunds*
20 days	1951-52	3	35
	1952-53	5	225
	1953-54	5	188
		Total	448
30 days	1951-52	2	33
	1952-53	4	175
	1953-54	4	185
		Total	393
40 days	1951-52	2	34
	1952-53	3	227
	1953-54	3	209
		Total	470

Palampur has an average rainfall of 110 inches, of which about 75 inches are received during July, August and September. It will be seen that under Palampur conditions, there is very little difference in the forage yields obtained from the three treatments. It may also be noted that the grass yield was low in the first season. This is because it took some time for the grass to establish itself.

(*Contd. on page 29*)



A typical case of the paralysis form of fowl Leucosis

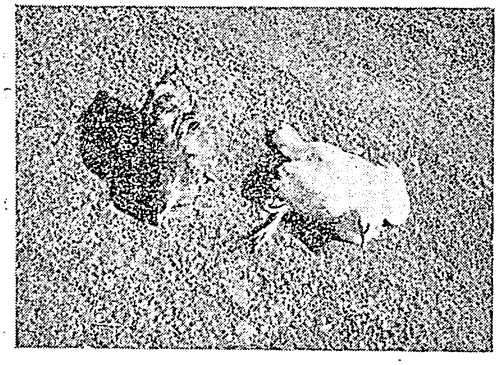


Leg nerve of a normal fowl (*left*) and that of a Leukenic one (*right*)

LEUCOSIS IS ANOTHER FOWL-KILLER

by

Krishan Gopal Mahindru



These young pullets are not patients of Leucosis, but are showing paralytic symptoms due to other causes

ENEMY No. 1 of the fowl, and a very cunning thief at that, fowl Leucosis can take a heavy toll of life from your poultry flock—up to 75 per cent—if you do not take timely steps to keep it at bay.

You may not be familiar with this name as you are with the names of some of the common poultry diseases like Ranikhet, fowl pox or coccidiosis, because Leucosis of the fowl is of recent introduction in our country. But be sure that once it encroaches on your flocks, it would be hard to get rid of it.

Leucosis is also known by other names such as fowl paralysis, range paralysis, lymphomatosis and neurolymphomatosis, and is widespread in almost all the foreign countries like Canada, the U.S.A., U.K., Denmark, New Zealand and Australia, where intensive poultry farming is practised. Cases have also now come to notice in our own country where exotic breeds of poultry are being maintained.

Leucosis is distinctly a disease of virus origin and affects birds between the ages of six weeks and 18 months. Incidence of the disease is the highest between the ages of four and 12 months. Older birds are resistant but not immune to it.

VARYING SYMPTOMS

Fowls affected with this disease show a variety of symptoms. This may be due to different strains of the virus causing the disease, or the severity and stage of the disease at which you notice it in a bird.

The paralysis form is by far the commonest form of the disease; hence, the name fowl paralysis or range paralysis. One or both the legs or wings or even the neck may be involved. The first indication of the disease is drooping of the wing or partial paralysis of one or both the legs. Gradually, the bird is unable to stand on its legs and is not able to reach its feed or water. Muscles of the affected parts wither away. Except for the paralysis, the bird presents a healthy appearance and maintains its appetite. In course of time, diarrhoea may set in, indicating digestive disturbances.

The other common form of the disease is the blindness form. In this form, the normal colour of the eye of the affected bird changes to gray. In severe cases, pupils fail to respond to light and the bird gets totally blind. Sometimes, the eyeball also bulges out. The birds may continue to find their feed or water for some time and may continue to lay well.

The third form in which the disease manifests itself is the Leukenic form or true Leucosis. The bird becomes pale, loses its weight and gets weaker day by day. Birds thus affected may live for several weeks.

The fourth is the tumour form. Incidence of this form is less than the three other forms described above. Tumours are seldom found on the body, but when present they may affect any part.

It is important to distinguish this disease from various types of paralysis due to injury, nutritional deficiencies, parasitic infestations or bacterial infections.

ENLARGED NERVES

In the birds showing symptoms of paralysis, observations on post-mortem will reveal the abnormalities in the nerve plexus and major nerve trunks leading to the affected leg or the wings. The nerves are generally enlarged and yellowish gray in colour. The cross striations of the nerves are lost and nodules may be present anywhere along the affected nerve. In the case of the Leukenic form of the disease, the liver spleen and kidneys are usually engorged and grayish red in colour, and are soft and flabby. The liver may be spotted with brownish or gray areas and easily ruptured. In the case of the tumour form, a mass of abnormal tissues may be found about the ovary, liver, spleen, kidney, or even the heart. The sizes of tumours vary very much. They are generally grayish or yellowish in colour; the centre of a tumour is generally yellowish.

A microscopic examination of the blood generally reveals the presence of an unusually large number of white blood cells. An examination of the nerve and other tissues of the body also reveals infiltration of large numbers of white blood cells.

CHECK INFECTION

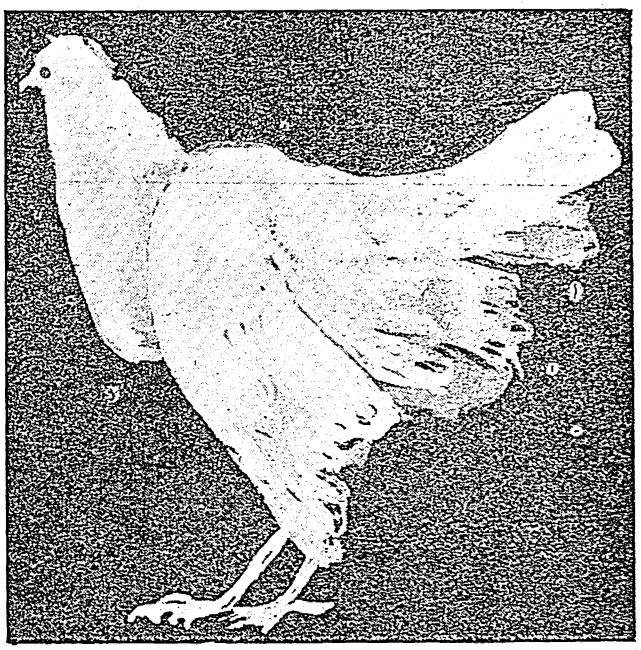
No effective remedial drug has so far been evolved. Infection is spread through contaminated water, feed, litter, infected buildings and even range. Older birds are believed to be carriers of the disease.

Chickens get the infection when they are quite young, but actually manifest the symptoms of the disease after a month or so. As soon as a bird is found affected with the disease, it should be immediately separated from the flock and destroyed. Dead birds should be disposed of suitably so that infection is not passed on to healthy flocks. If majority of the birds show symptoms of the disease, the whole of the flock may be disposed of and the poultry pens suitably disinfected. These pens should be kept vacant for a month or so before starting afresh with healthy stock.

It is believed that birds which live through the disease acquire some degree of resistance against it. This, however, is not a confirmed view. But, taking advantage of this presumption, efforts should be made to hatch eggs from grown up birds and not from eggs layed by pullets.

Always be careful, and watch out for this enemy which may stealthily encroach upon your precious flock. Take due precautions when purchasing new stock. Do not mix the purchased birds with your flock for at least a month. Always purchase your requirements of birds and eggs from clean flocks. Off and on, consult your Veterinary Surgeon for advice on the health of your birds.

Wing paralysis in Leucosis



A new remedy for Soft Rot of ginger

by
K. Fazlullah Khan
O.S.D. (Spices), I.C.A.R.
Ernakulam

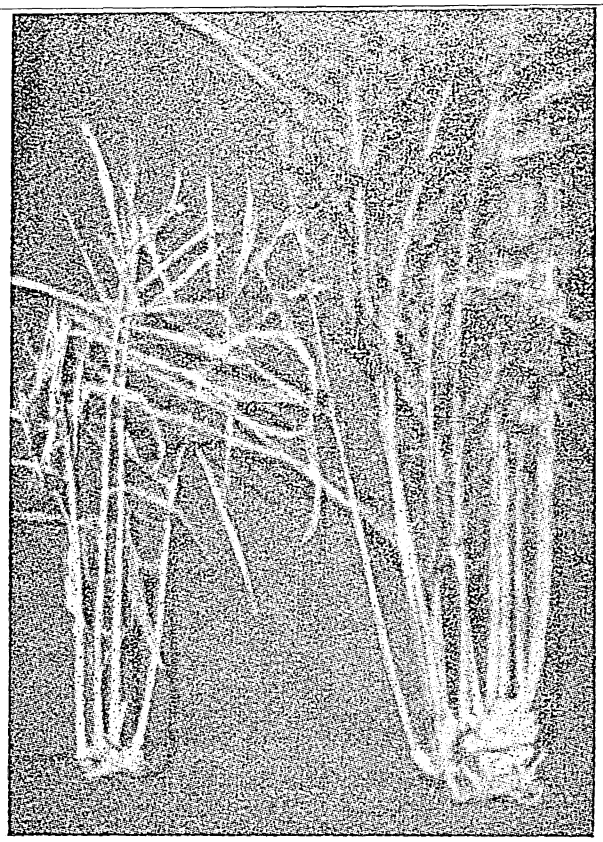
REMEDIAL measures are now available to ginger growers who have been seeing their ginger crops being attacked by the Soft Rot disease.

These measures were a result of systematic research conducted at the Agricultural Research Station, Wyanad, in Kerala State, and sponsored by the Indian Council of Agricultural Research.

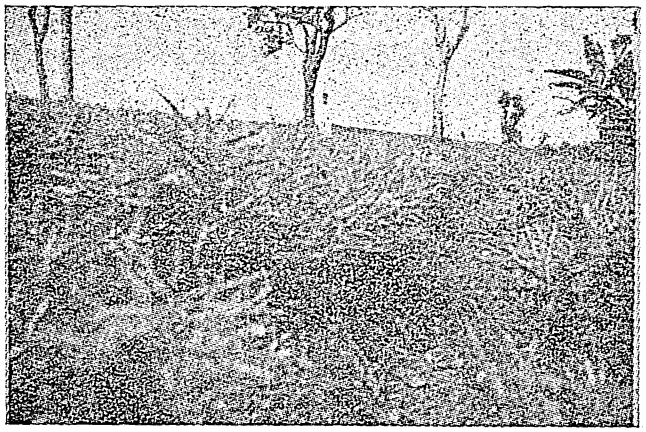
Soft Rot affects the rhizome, the most useful part of the ginger plant. As such, the grower incurs a heavy loss. The disease, caused by a fungus, is spread through the soil as well as the seed. Such conditions as lack of drainage, clayey soil, heavy rainfall or continuous dampness help the disease in its spread.

When this disease appears on ginger, one of the very first signs is the yellowing of the leaf-tips. This yellowing gradually spreads to the entire leaf and the leaf-stalk, and finally the plants begin to wilt. In the advanced stage of the disease, the plant becomes weak at the collar and a slight touch makes it to separate out of the clump, leaving the rhizome a bit under the soil.

Ginger is grown over 39,700 acres, chiefly in Kerala, Madras, Mysore and Andhra Pradesh. Kerala alone accounts for 66 per cent of the total ginger production of the country. When the disease outbreak is serious, there are instances of growers losing even 80 to 90 per cent of the crop.



This is what Soft Rot can do to a ginger plant (*left*). Compare it with a healthy plant on right



This ginger crop is quite healthy because it received a "cheshunt" compound dressing

PERFECT DRAINAGE

Results of experiments now show that the most effective preventive measure against Soft Rot is growing ginger in a soil where there is perfect drainage. Clayey and retentive soils are to be avoided and highly fertile, open-textured loams to be preferred.

A second step is to strictly observe a rotation when ginger is cultivated. If ginger follows ginger, there is every likelihood of the disease reappearing through the soil. The alternate crops which can be grown are *ragi*, elephant's foot, yam and tapioca.

It is most important, however, to select rhizomes for planting carefully. They should be absolutely free of the disease symptoms. As soon as a crop is harvested, fair-sized rhizomes free of soft, blackish spots, indicative of the disease, should be selected. A rhizome affected by Soft Rot easily yields to the pressure of the

finger. It may also give out a bad smell. However, if the disease is in its early stages, there will be stray ash-coloured patches or a fuzzy growth of the fungus here and there on the surface of the rhizome. A healthy rhizome, on the other hand, is fairly hard, heavy and perfectly green.

CAREFUL CHECK-UP

The rhizomes need careful examination because the fungus is often found in the crevices or depressions of the rhizome bits. To get rid of this fungal infection, it is better that the rhizomes selected are dressed with wettable " Ceresan " of 0.25 per cent concentration (four ounces of wettable " Ceresan " in ten gallons of water), preferably in an earthenware pan or cement tub. The seed material is immersed in this solution for half an hour, and then removed and spread in shade until dry and free of water. These rhizomes can then be stored until required for sowing.

The disease has also been investigated in the field. The most effective fungicide for controlling it has been found to be a compound prepared by mixing ammonium carbonate and copper sulphate—11 parts of ammonium carbonate with two parts of copper sulphate (by weight). This mixture is commonly called the " cheshunt " compound.

To prepare the compound, the two chemicals are separately powdered, then mixed thoroughly and stored in an air-tight tin container for at least 24 hours. A solution is then prepared from the compound by dissolving an ounce of the compound in two gallons of water. The solution is put in coconut shells or spoons, and applied to the base of the affected plants at roughly six ounces per clump.

AT SOWING TIME

It is better to apply this fungicide even at the time of sowing. This is done by placing the rhizome bits in their respective pits and splashing a small quantity of the solution over each of the bits after they are planted. This ensures not only the dressing of the seed with the fungicide but also of the surrounding soil. Thus, it will be a soil-cum-seed treatment. By adopting this practice, very good results have been obtained by many growers, in many cases the control being cent per cent.

If the disease appears at a later stage of crop growth, it spreads very rapidly and covers a large area in a day or two. Such serious cases need a more thorough treatment. The affected patches should be carefully removed. The affected plants in the crop as well as the area surrounding the patches to a distance of at least ten to 15 feet all round should be given a heavy drainage.

In any case, the grower should have a watchful eye on the crop, so that he may take up timely control measures. Otherwise, the disease would spread rapidly, making its control more difficult and expensive.

It is also claimed that the cheshunt compound not only acts as a fungicide, but also as a fertilizer. This is so because the ammonium carbonate and copper sulphate contained in it react to give out ammonium sulphate, which is a good fertilizer. Using the compound, therefore, will not only control the disease but will also make the plants grow vigorously and produce better.

ROTATIONAL GRAZING

(*Contd. from page 25*)

The highest output of 470 maunds in the three years came from the 40-day interval plot, indicating thereby that grazing in rotations at intervals of about 40 days was helpful to good sprouting, good stand and good growth of the crops in the pastures. Where the rainfall is high, the growth is faster. During the rains, the grasses sprout and grow very well even if cut at an interval of 20 or 30 days. The growth, however, varies with the variation in rainfall, and in turn affects intervals between the two grazings.

From the experiment, it is clear that grazing at intervals of from 20 to 40 days or thereabout in rotation is one sure way, and in some cases the only way, of improving badly grazed areas and enhancing their forage production.

Farmers should, therefore, divide a large grazing area into three or four convenient parts and graze each separately with a reasonable number of livestock. Thus, they will help in the judicious grazing of the one portion while helping the uniform sprouting and growth of grasses in the others.

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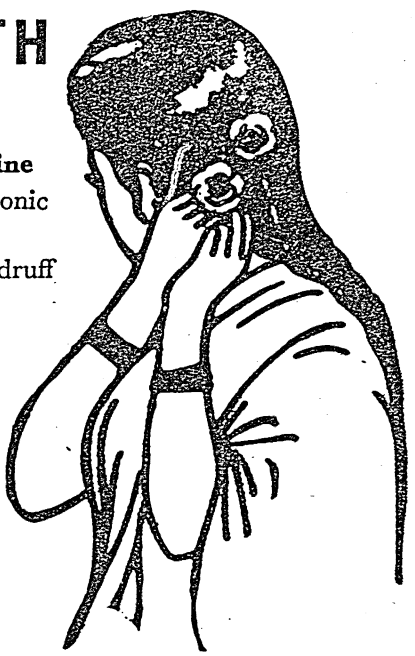
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No Racing For Time If You Use This Threshing Machine

by

S.K. Paul

Agricultural Engineer (Implements)
Punjab Government

AFTER the wheat crop has been harvested in the Punjab starts a race between nature and man. The produce has to be threshed and the grain and *bhusa* safely stored as quickly as possible. This requires a good deal of labour, and it is just at this time that labour is scarce. No wonder too, because 25 per cent of the country's wheat area is in the Punjab alone.

In view of such a situation, the Punjab Department of Agriculture directed its efforts at evolving a suitable machine for the threshing and winnowing of wheat, so that the labour problem could easily be solved. The Agricultural Engineer (Implements) of the State succeeded in evolving what has come to be known as the Punjab Wheat Threshing and Winnowing Machine.

The threshing and winnowing machine is seven feet × four feet × five feet, and weighs 30 to 35 maunds.

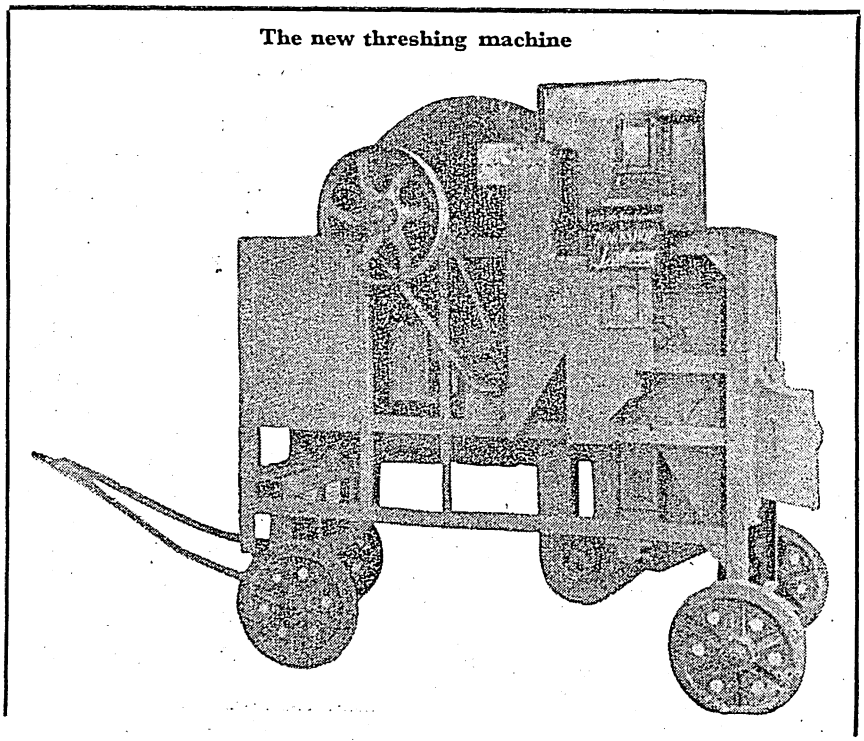
The machine has the following parts.

(1) Decorticator for threshing the harvested crop.

(2) Winnowing chamber into which the threshed stuff, both grain and *bhusa*, falls through the bottom of the decorticator.

(3) Suction fans which create suction so that *bhusa* falling into the winnowing chamber is lifted, separated out of the grain and passed through a suital le-sized sieve bottom of the winnowing chamber and carried through a chute to the elevator.

The new threshing machine



(4) Elevator which lifts the grain to a suitable height to fall through various passages for further cleaning and ultimately into the bag placed at the exit end. The further cleaning of the grain also takes place in the elevator due to suction.

(5) Eccentric to oscillate the winnowing chamber so that the threshed stuff may not get jammed in it.

(6) Framework on which all the five parts are suitably fitted to form a single workable unit. The framework has wheels for transporting the machine from field to field.

PERFECT SEPARATION

The suction created in the machine perfectly separates the grain from the *bhusa* and the nodules unlike when air is blown on the threshed stuff. The *bhusa* produced is also well bruised and soft. Adjustments are possible by which the size of the *bhusa* can be changed according to the requirements of the user.

The machine has been given exhaustive tests. The following data have been collected regarding its working.

The machine requires 20 B.H.P. to work it. This power can be supplied by a tractor, an engine or an electric motor. The greater the power, the better the results. The output of the machine is 24 to 30 maunds of the harvested stuff per hour, of which eight to ten maunds will be grain and 16 to 20, *bhusa*. The better the crop, the more the output of grain.

The breakage of grain has been found to be not more than one per cent and wastage of grain not more than 0.1 per cent, which means that hardly half a *chhatak* goes out with the *bhusa* from a maund of grain.

FAST AND ECONOMICAL

With a tractor in a reasonably good condition for supply of power, the cost of threshing comes to about fourteen annas per maund of grain when the crop is normal (when 33 per cent grain can be obtained from the total harvested stuff). With an electric motor, the cost is six annas per maund and with an engine, about twelve annas per maund.

In working out the cost of threshing, depreciation, interest on investment, repairs, housing of the machine, labour employed, driver's pay and supervisor's pay, all have been taken into consideration.

Apart from the low cost of threshing and winnowing, the machine has other advantages to offer to the farmers. The threshing and winnowing are done quicker by the machine than by any other method. The power machines can complete threshing and winnowing of 400 maunds of wheat grain in four days at the most. This will be the produce of 40 acres if the yield is average and 20 acres if the yield has been high. Compare this with 20 to 30 days taken by three pairs of bullocks and three *phallas* which an average *zamindar* is able to employ for the work. Threshing and winnowing by the machine will enable the owner to collect his grain and *bhusa* well before the rains or the start of bad weather. The *zamindar* who owns a machine can also supplement his earnings by threshing and winnowing the produce of his neighbours.

NO DRUDGERY

The invention also takes the drudgery out of threshing and winnowing. Men and animals are saved from doing continuous work in scorching heat; many a time, they suffer from sore feet during the season. This will be avoided.

Wheat and *bhusa* being free from dust, fetch a premium in the market. The *bhusa* being well bruised and fine, is very much relished by cattle. The wheat being practically clean, can go direct to the milling machine without needing any cleaning or pre-milling.

When the machine is at work, men and bullocks can easily attend to other operations such as working the Persian wheel. It will also allow the *zamindar* to sow the following wheat crop in time, water it properly, get more yields and consequently more income. There would be a great saving of grain from the use of the machine, as the grain will not remain exposed to wasteful elements such as storm, rain, birds, ants, insects, rats, fire and theft. This will mean more grain available for consumption and more money to the farmer. By the traditional method, it will be realized, there would be a grain loss of up to ten per cent.

The grain threshed by this machine also remains free of impurities such as urine and dung of animals on the stuff. The grain is, therefore, more hygienic.

To help the maximum number of farmers make use of the machine, they must own and use it on a co-operative basis. Those who can afford to buy can be owner-operators and hire it out to others. The power winnowing and threshing machine is the first of its kind to be developed in India. Surely, it is a great step forward towards the advancement of farming.

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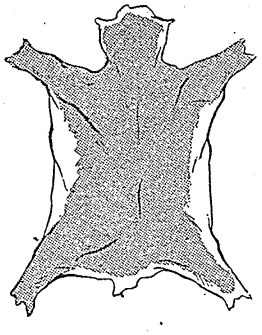
WHAT'S NEW IN FARMING

BRINE-CURING OF HIDES

BRINING or immersing cleaned hides in a saturated solution of salt has been found to have greater advantages over wet-salting commonly followed in curing hides.

In brining, the hides are immersed in the saturated salt solution for 24 hours, after which they are drained over poles and spread out. Salt may or may not be applied again, and the hides properly piled till transported to the tannery.

Experience shows that brine-cured hides are superior to wet-salted ones. Brine-curing affords them greater protection under adverse conditions. Even during long storage, such hides



do not get 'salt stains.' Again, they do not need any washing prior to soaking them in the tanncy. They also need much less of soaking.

Leather obtained from brine-cured hides has more fullness and a brighter grain side.

HARVESTING COCONUTS

IF YOU are harvesting coconuts for copra-making, harvest them only



when they are fully mature. Coconuts are mature at 12 months.

But, if green husks fetch a premium price in your area for retting purposes, harvest the nuts a month earlier.

Experiments show that by harvesting nuts a month prior to their full maturity, the copra yield will be less by six per cent, with ten-month old nuts the loss is 16 per cent and with nine-month old ones, 33 per cent. The loss in oil will also be to a similar extent. Moreover, copra from a 12-month old nut will be crisp and white.

Experiments also show that fibre from the husks of 12-month old nuts is of inferior quality, being brittle and of a brownish colour. Fibre from 11-month and ten-month old husks is good, being elastic and of a golden yellow colour. On the other hand, fibre from a nine-month old husk is inferior.

HIGHER COTTON YIELD

HIGHER yields are being obtained by farmers who are adopting improved cultural methods in growing cotton. The methods are:

1. shifting the sowing date of *Cambodia* cotton to September (Where this is not possible, adopting a closer spacing of three inches between plants.) ;
2. shifting the sowing date from March to December in South Arcot district ;
3. economizing on water by adopting ridge planting ;
4. removing *cholam* (*jowar*) stubbles immediately after harvest for conserving soil moisture for the following cotton crop ;
5. growing clusterbean mixed in the preceding crop of *cholam* (*jowar*) in Coimbatore district, and growing indigo mixed with *irungu cholam* at Koilpatti.

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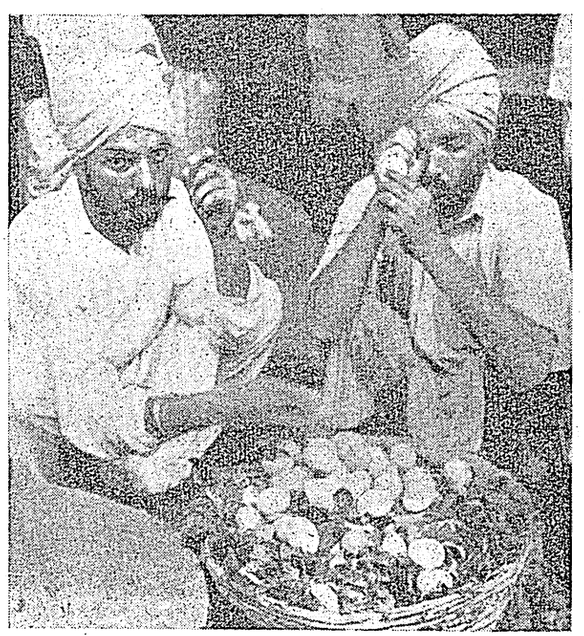
Indian Council of Agricultural Research

Queen Victoria Road
NEW DELHI—2

GRADED EGGS ARE ALWAYS A BETTER BUY

by

Ali Imam Naqvi,
Marketing Officer
Directorate of Marketing and Inspection, Nagpur



The egg-seller's and buyer's way of checking egg quality

PRODUCING 46,450 lakh eggs a year is indeed a tall order. This is the target figure for egg production for the Second Five Year Plan period. But, the number does not look too big when you realize that it will merely take the per capita consumption of eggs from eight to 20 in our country.

Four Regional Farms will acclimatize foreign breeds of poultry and raise improved stocks for distribution to 300 Extension Centres in the country. This will improve the production by about 50 per cent.

Providing proteins, fats, minerals, vitamins and other life-sustaining ingredients, the egg is the food that can take the national nutritional level very high. That is why so much importance is paid and efforts are made towards taking the average per-hen production of 53 eggs a year to as high as 120 eggs per

bird—the average in other countries.

PERFECT FOOD

Eggs, no doubt, are a perfect and valuable food, but they should be fresh and of good quality. Normally, those sold in the market reach the consumer a few days after they have been laid. During this period, they are handled under ordinary atmospheric conditions and, therefore, they become unfit for consumption due to the development of various defects like staleness, watery white, blood spots, meat spots, rot and moulds. This is specially so during the summer months when the temperature in the plains is generally high.

When you buy an egg from the market, you have to be guided only by your visual examination to find out whether the egg is fresh or stale. How you wish that the egg offered for sale to you had some guarantee with it that it was fresh!

GRADING

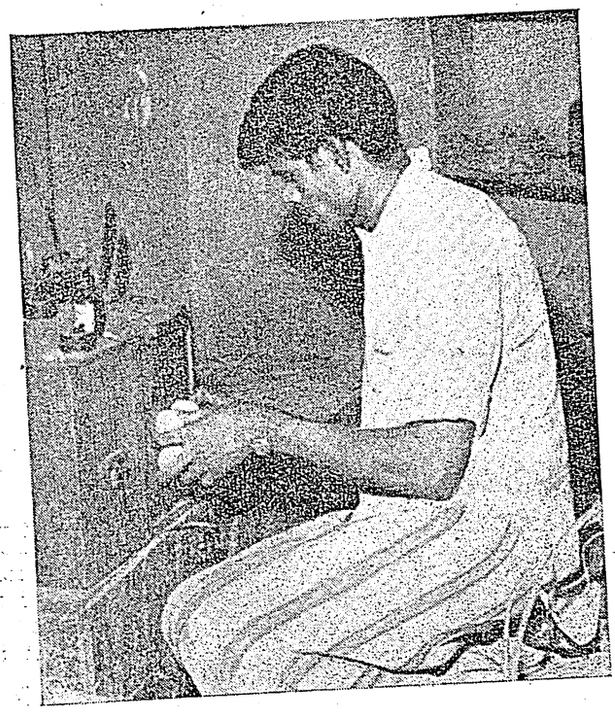
That is why the grading and marking of eggs was considered necessary. Eggs are being graded at present in Delhi, Punjab, West Bengal, Madras, Mysore and Bombay States.

Hen and duck eggs are graded into four grades: extra large, large, medium and small, according to their weights. The minimum weight prescribed for each of these grades is two ounces, $1\frac{3}{4}$ ounces, $1\frac{1}{2}$ ounces and one ounce for hen's eggs, and $2\frac{1}{2}$ ounces, two ounces, $1\frac{3}{4}$ ounces and $1\frac{1}{2}$ ounces for duck's eggs. Specifications for the internal quality for all grades are, however, the same. Eggs tested for internal qualities ensure that they are free from staleness or other defects, as only sound eggs are graded and marked.

The moral is: buy only graded and marked eggs.



Grading of eggs according to their weights assures you full value for your money...



... candling ensures that you get quality eggs

FARMING ELSEWHERE

(*Contd. from page 23*)

Fyodor Kim reduces the water level prior to the application of supplemental fertilizers, and then gradually increases it again in the course from the fields before harvesting; this is very important, because it increases the resistance of the rice plants to lodging and facilitates machine-harvesting of the crop. Our experienced waterer sees to the timely cleaning of the small irrigation network, keeps the irrigation appliances in proper shape, participates in planning the use of water and also looks to proper watering.

Experience has shown that chemical fertilizers play an important role in rice cultivation, especially when used before sowing, and later in the form of supplemental application of nitrogenous and phosphorous fertilizers. Fertilizers, when applied in supplemental doses, boost the yields to twice as much as when the fertilizers are given in only one full dose in the spring. This is why we have been practising supplemental application of fertilizers extensively in recent years.

coconuts and spices make a nice combination

by

P. Abraham

COCONUT and arecanut farmers should think of growing with profit spice crops in their gardens as intercrops.

Most growers raise annual crops with the help of the monsoon rains from May to October as intercrops in the palm gardens. In household gardens, mango, jack and other useful trees are usually grown. However, no perennial crops as such are grown in the farm gardens.

Pepper and cardamom, the great spices, are most suitable for growing as intercrops, pepper in both coconut and arecanut gardens and cardamom in arecanut gardens.

In parts of north Travancore (Kerala), apart from pure pepper plantations, growers also adopt mixed cropping. Pepper, as an intercrop, is trained on *Erythrina indica* and other standards in coconut plantations, both pepper and coconut being planted at the same time. Pepper is kept in the plantation for 12 to 15 years, by which time coconut trees come into full bearing and the vines die off.

PEPPER AND ARECANUT

In certain parts of Mysore, the arecanut tree is the standard for pepper vines not only in household gardens, but also in arecanut plantations where cardamom and banana are other subsidiary crops. These gardens being situated on the low slopes of valleys, elaborate arrangements are made for drainage, as natural drainage is defective. Individual gardens vary from two to ten acres. The gardens receive clean cultivation and regular manuring. Trees receive green leaf mulch at a depth of two to three feet in alternate years. In the other year, each tree receives a basketful of cattle manure. The pepper vines get the benefit of the attention given to the arecanut palms on which they are trained. They do not receive any special attention except for the tying of the vines on the standards. The leaf sheaths of the arecanut palms are torn to strips and are used for this purpose. The full-grown vine is tied at 20 places, as the arecanut palm does not offer a good hold for the early climbing roots of pepper. The vegetative runner shoots arising from the base of the vines are "layered" and trained on to the standards.

This method of growing pepper needs to be copied in other pepper and arecanut-growing areas. The pepper will yield a substantial additional income.

Some years ago, pepper vines being trained on coconut trees could be seen here and there on the West Coast. This was not considered a good practice as it was feared that it would be bad for the growth and productivity of the coconut trees. This attitude, however, has changed in recent years and excellent pepper vines are being grown on coconut trees in homestead gardens all over the West Coast. Even if the growth and productivity of the coconut trees is affected to a certain extent, the produce from the vines would more than compensate for the drawback.

Pepper vines find not only the coconut, but also the palmyra, the bastard sago and the wild date-palm as good standards. Among these, however, the coconut seems to be the best, and seems to adjust itself with the pepper vine in getting its nutrition and moisture in the soil. On the other hand, when the coconut tree is manured, the pepper vine also benefits from it.

COCONUT STANDARDS

However, it is only in areas where soil moisture conditions are unfavourable, especially in the dry season, that the pepper vines can also be grown with success on the coconut tree. The coconut tree provides just the shade required by the pepper vine in the hot season, provided the trees are spaced about 25 feet × 25 feet. If the trees are planted closer, the shade will be too heavy for the normal development of the pepper vines. The ill-drained or water-logged soil is not suitable for the pepper vine even though tolerated by the coconut. You must also remember that where pepper vines are interplanted with coconut trees on standards, the vines will be productive only during the pre-bearing period of the coconut trees. Once the palms start bearing, the vines will die out. This will not happen when the vines are planted near the coconut trees and the tree used as standard.

Interplanting coconut with pepper is usually done on hill slopes which dry up during the dry season. Under such conditions, young coconut trees in their pre-bearing period may not compete with the vines in-between them for soil, moisture and nutrition but will do so when they come to full bearing. Pepper should be planted in association with coconut where the soil moisture conditions are favourable for the mixed crop throughout the year.

(*Contd. on page 40*)

research, but of a practical kind

by
P.S. Khankhoje

OUR research workers are no doubt contributing to the national progress through their fundamental or theoretical research, but the most important problem at present facing the nation is the food crisis, to which the Second Five Year Plan is giving special importance. It is, therefore, the duty of the research workers to help the Government solve this problem by paying more attention to research that will lead to more yields with minimum expenses to the farmer.

The importance of rural agricultural research is not so well understood in India as it is in progressive countries like the U.S.A. Here, even many learned men do not grasp the meaning of rural universities which form the hub of rural development in those countries. I visited several important agricultural research institutions of the country and noticed that more attention was being paid to the theoretical part of the investigations rather than to the practical application of the research on the farms in the villages. The theoretical research is necessary, but under the present backward condition of the farmer and the insufficiency of foodgrains and other food materials in the country, research that will lead to more and profitable production must be encouraged. This will help the Second Five Year Plan become a success.

Agriculture is a very complex subject and needs the application of pure and applied sciences like Physics, Chemistry, Biology, Zoology, Botany, Physiology, Entomology, Minerology, Engineering, Medicine and other professional branches with different kinds of machinery and appliances for agricultural production. Therefore, theoretical and practical researches are linked together and realistic methods are evolved to get good crops. Even in advanced countries like the U.S.A., for instance, there are farmers' bulletins explaining to the farmers the practical rural researches. In those modern countries, every effort is made to solve the farmer's problems from all angles in order to help him make agriculture a profitable enterprise.

EVERYDAY PROBLEMS

All scientific progress is achieved on the fundamental scientific research, but rural research is sometimes so simple that the name of the booklet or bulletin does not give the impression of a scientific appearance. In many of these researches, the ordinary or everyday problems are studied. Farmer's practical difficulties are explained and solved in simple language that can be understood by people with less education. The following titles will give an idea of some of the farmers' bulletins issued in the United States.

Rural housing in western region, Cold storage of fruits and vegetables, Water and plumbing system for farm homes, Root crop for home use, Better things in farm life, Peppermint as a farm crop, Drying fruits and vegetables, Farmers' canning club, Brining vegetables and making pickles, ice-creams, etc., Quarterly bulletin on farm research, Bulletin on dry farming, Different kinds of irrigation, Fodder concentrates, Practical methods of cultivation, Commercial implements in school gardening, Prospective market and distribution of apples, Making feeding silage, Apples and fruit packing, Feeding dairy cows, Food-drying process and importance, Boys' and girls' agriculture club, Parcel post business methods (for farmers), Marketing farm products, Feeding values of waste products, Rural relations of high school, Common errors in cotton production, Preparing straw-berries for market, Cost of producing milk on farms, Farm sheep raising, Farm management, House canning costs, Farms shops, U.S. grades, standards, packing requirements (for honey, etc.), Planning the rural hospital and health center, Relation of agricultural education to farm organizations, Soil sense, Country schools and domestic economy in Wisconsin, Vegetable seed treatment, Methods of harvesting grain sorghum, Food conservation in elementary school, Food waste and garbage.

This list is sufficient to give an idea of practical research. The real research and fundamental research bulletins are intentionally not mentioned in the above list.

There are so many practical problems to be solved in the agricultural field that a complete list of them is impossible to make. Each state has its own problems, besides the national agricultural problems.

In every agricultural zone, there are staple and secondary crops. All these have the main as well as by-products. In India, most main products are not well utilized, and, in some cases, the main product is all wasted, for instance, the cotton plant after the cotton harvest. In

crops like wheat, rice, sorghum, *jowar*, pulses, etc., the grains are used as food and the rest as fodder. Most of this fodder material can be used in making nutritious concentrates for cattle and other farm animals. In ancient India, every village had special arrangements to preserve the grains or agricultural products in subterranean *pevas* (well-like dry cold storage) for several years. Today, our villages have no such arrangement. There used to be even arrangements to keep the cattle fodder for years; now more than half the fodder is wasted.

SMALL-SCALE GINNING

The cotton crop is primarily a crop of the Deccan Zone, and some good seeds are distributed officially. But as the *kapas* or seed cotton is sold in the market for ginning, the farmer does not keep any seeds for himself. In olden times, the farmer used to make his seed selection by working on his own *recha*, which now has disappeared. To remedy the situation, small-scale modern ginning could be introduced in villages and seed selection in consultation with the local agricultural officers encouraged. If small cotton seed oil mills are also introduced as a cottage industry, oilcakes produced could be used as cattle feed. At present, all cotton is sold to the cities and then oil or oilcake is bought. The situation could be improved, but research on such a pilot extracting plant must first be made.

Linters, hulls and kernels have oil and protein in different proportions, but at present, except for the kernels or seeds the other parts of the plant are not utilized. All this valuable material is practically wasted. The non-nitrogenous content of cotton hulls is an important constituent, from which such useful products as furfural, crude cellulose and Lignin could be made. Vitamin B complex could be obtained from cotton seed. Cotton linters are also useful because they contain paper material, cellulose, rayon, plastic and other useful industrial materials that could be converted into wealth.

If this point is kept in view while conducting studies on crops such as rice, wheat, pulses, oilseeds, and other food crops, many secondary industries could be created in the villages.

India probably leads the world in groundnut production. But oil and oilcake are the only products of importance. Groundnut cake is usually used for fertilization, whereas valuable human and cattle food could also be prepared from this material. In the U.S.A., many by-products are prepared from groundnut. After making these useful products, the rest of the waste could be utilized as fertilizer. The present practice of using whole or unprocessed groundnut cake is not economical.

Another important crop awaits full exploitation at our hands. It is soyabean. China, Japan, the U.S.A. and other countries greatly value soyabean. In the U.S.A., more than forty products have been developed from it. The soyabean oil industry is an important industry in China and the U.S.A. The Ford Company has developed this oil industry and cultivation of soyabean in the U.S.A. to a great extent, and is using soyabean oil in Ford cars.

Soyabean oil can be used in the manufacture of paints, drying oils, synthetic resins, soaps, waterproofing, cement, rubber substitutes, etc. Soyabean milk, cheese, sauce and other products are commonly used in China and Japan. It is also an important cattle feed concentrate and poultry feed in the U.S.A. and other countries.

HARDY CROP

Soyabean is a hardy crop that grows well in India. Unfortunately, it is not used in Indian dietary. Biscuits, bread and other nutritious foods made from soyabean need to be popularized. Following are some of the products that the soyabean crop can supply.

Plant. Green pasture, dry fodder, green manure

Green seeds. Breakfast food, Macaroni, green cooked beans, green conserves, salads

Children's food. Biscuits, bread, sauce, milk, sweets

Dry seeds. Toasted like *chana*; milk, cheese, condensed milk, casein, butter substitutes, edible oils, soups, coffee, glycerine, explosives, varnishes, paints, cellulose, plastics, lubricants, printing inks, rubber substitutes

Hormones. Male and female hormones

The use of fertilizers for higher yield has been one important factor in our agricultural development, but production of strains giving higher yields under good fertilization has not been given much attention though the country has made some progress in evolving disease-resistant seeds. *Jowar* with more ears and perennial cajanus can easily be developed. The technique of raising a subsidiary crop to meet crop failures could be introduced. For example, *jowar* could be grown as a second crop by irrigation if the main crop had to be harvested or cut because of failure. Dry farming methods could be developed. Similar research could be carried out in respect of cereals, leguminous oil and other important crops.

Development of nutritious and hardy forage crops also needs more attention.

The cattle wealth of India is enormous but most of it is a liability. Cows give the minimum milk, and are sometimes called *gobrel* cattle (for cow-dung production). Bullocks are weak. Animals are not kept in stables. There are no pastures. Fodder is poor and scanty. And, in some places, there is even scarcity of water.

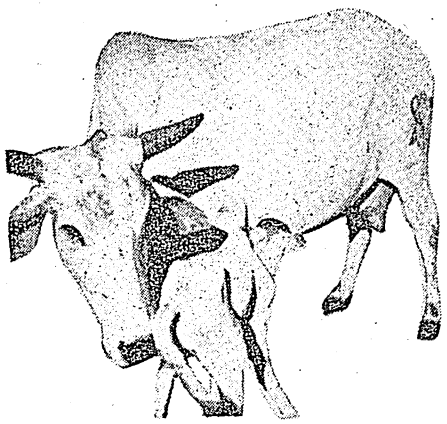
In other countries, sheep, goat and pig-raising is a very profitable industry. Sheep and goats, besides their usual use, are considered as milk animals. Cheese, butter and allied products give a side income to the farmer. But, this is not the case in India. Grazing techniques have not been developed. Leguminous fodder crops and nutritious concentrates for animal feeding require more serious attention. Establishment of concentration camps for unproductive animals and artificial insemination centres can help a great deal. Similarly, utilization of village wastes in the feeding of poultry and other birds could prove valuable.

ANIMAL WASTES

Considerable work is being done on compost, etc., but most cattle-dung, urine, fodder waste, fallen leaves, bones, horns and hoofs, feathers, of poultry and other animal wastes do not play any part in the village economy. Bullock and cattle power is not properly harnessed.

(*Contd. on page 40*)

Cow-care Before Calving



A freshly calved cow

by
S. G. Latey

PREPARING for the calving of the pregnant cows in your herd begins months ahead of the time.

A wise dairyman always keeps a record of the date on which the cow was served, because this way he will know when exactly to expect the calf. Normally, a cow carries a calf for 285 days, but the period may vary by eight to ten days, depending upon the health condition of the cow, its breed and season and also how it is fed and looked after.

In the last two months of the pregnancy, the dairyman has to take some important steps. The cow should not be milked for this period, but given rest so that she can build up her reserves. Then only can the cow build up sufficient strength for successful calving and also be able to give the calf a healthy start.

At this drying off stage the cow's health should also be looked into. If she was suffering from mastitis, then it is necessary to get the veterinary doctor to treat her teats with penicillin so that the disease may not occur.

PROPER PASTURE

Another important thing to do is to see that the cow gets the proper pasture. A good dairyman avoids putting the cow on low-lying pastures infested with flies. A pregnant cow approaching calving should also be grazing near about the farm, so that she can be observed at all times. In fact, a pregnant cow should always be watched at least for a few minutes a day. If there is any restlessness or the cow moving away from the rest of the herd, it is to be taken as a sign of the approaching calving, otherwise it may also mean that something is wrong with the cow.

EASY TO HANDLE

If you are in an area where mastitis is prevalent, it is better to be watching for signs of mastitis. Look out for uneven swellings of the udder or pain or any other sign of discomfort. It is easier to treat the cow at this stage because she will be easier to handle. It is also necessary to tie her up in a cow-house so that she may get used to her surroundings by the time she calves.

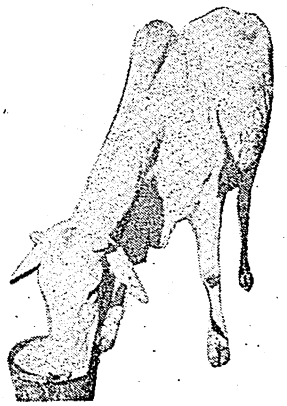
Six weeks before calving, the cow should start getting special ration. This ration should be given according to the milk yield expected. The ration should contain sufficient quantities of minerals and vitamins. The ration should be gradually increased till the day of calving approaches.

GENTLE MASSAGE

When calving time approaches, the udder will become markedly swollen, hard and tense. The cow will straddle her hind legs, move uneasily from side to side and occasionally glance backwards. The udder should not be touched at this time, excepting to give it a gentle massage. In some cases, the cow may get some relief if you ease off each quarter by drawing out some of the contents of the udder. However, this will have to be done continuously to ease the cow of its discomfort. The fluid that is drawn out is watery or straw-coloured and rather sticky. Later on, it changes to normal milk. But you should be careful to wash your hands with a disinfectant to see that you do not infect the udder while massaging.

It is not a good practice to allow cows to calve out of doors. An ideal place would be a loose box

Some time before calving, cows should get exclusive rations



with a smooth floor and walls of cement. The loose box has to be thoroughly cleaned after each calving, so that if there is any disease infection it may not spread to the next cow and calf.

So that the cow may be accustomed to the loose box before calving, she should be housed there three or four days before the event and taken out only for short periods for exercising.

Two or three days before calving, the concentrates should be stopped, but such things as bran mash or a small amount of molasses may be given so that the cow's bowels may be free.

CALCIUM INJECTION

If it is the third, fourth or fifth calving of the cow and if she had milk fever previously, then it is better to get such a cow given a calcium injection by the veterinary doctor about 12 hours before calving.

When the cow calves, leave her free in the loose box. Tying her up at such a time is not safe. Let nature take its own course, and interfere only when it is necessary for you to do so.

ACTUAL CALVING

Before actual calving, the water bladder appears and soon afterwards the nose or foot, then two feet, then the head and the shoulders. Once the shoulders come out, the broadest parts of the calf are through and as such there will not be much trouble afterwards. The water bag or bladder dilates the womb of the cow and makes it easy for the calf to come out. The fluid in it also acts as a shock absorber and lubricates the calf. It is not good to rupture this bag unless it is necessary to do so.

Another important thing to stress is cleanliness. A thorough cleanliness if observed means freedom from disease for both the cow and the calf.

COCONUTS AND SPICES

(*Contd. from page 36*)

Where pepper vines can be productive only during the pre-bearing period of the coconut tree, varieties like *Narayakodi* and *Karimunda*, which are quick-bearing and short-lived should be planted. Where the situation provides good moisture conditions throughout the year for the mixed growing of pepper and coconut, long-lived and productive varieties of pepper such as *Kalluvally*, *Kottavally*, *Kaniakadan*, *Chola* and *Kothanadan* should be planted.

IN MYSORE

In parts of Mysore, cardamom is grown as a subsidiary crop in arecanut gardens. This is a smaller cardamom, productive even at a lower elevation of 1,500 feet. The plantations being raised on elevations ranging from 1,500 to 2,400 feet, cardamom seedlings are planted with a spacing of six feet × six feet. These plants take advantage of the heavy green mulch given to the arecanut palms. When arecanut husks are also spread in the garden, the cardamom gets this additional mulch, grows well under the shade of the arecanut trees and produces 15 to 20 pounds of dried cardamom per acre, which is a substantial additional income besides what is obtained from the pepper vines grown on the arecanut trees. Such a profitable mixed cropping is found mostly in the Sirsi and Siddapur taluks of North Kanara and the adjoining areas of North Mysore.

Ginger and turmeric are two other spices grown as intercrops in coconut and arecanut gardens. These are annual crops raised with the help of the monsoon rain, and do not interfere with the moisture requirements of the palms. These spices are planted on raised beds in-between the palm trees and grow on the green leaves and cattle manure applied. The weedings given to the crop ultimately help raise the productivity of the palms.

Growing of spices in arecanut and coconut gardens will go a long way in the development and extension of cultivation of spices in our country.

PRACTICAL RURAL RESEARCH

(*Contd. from page 38*)

as is done in Japan and other countries. Many new modern devices of America and other advanced countries could be introduced for profitable agricultural work. The efficiency of our agricultural labour could be increased by introducing modern tools.

NEW USES

New uses could be found for agave, bamboo and other forest products. Orchard wastes such as fallen leaves, flowers and fruits could be utilized in some manner rather than wasted, and modern nurseries could be introduced. Industries such as bee-keeping and silk-raising could be popularized. Small motors, engines, pumps, generators and other modern implements could be popularized. In crop production, tobacco waste, dust insecticides, detergents and repellants could be popularized.

Smithy, carpentry, oil *ghani*, handloom and other village industries played a very important part in the old village life; at present, they are in a state of sad neglect. Attempts should be made to revive these and improve the local resources of the villages. The spirit of mutual help and co-operation should be fostered among the village people.

SELF-SUPPORTING

Every village should be self-supporting in its daily needs. Fruit and vegetable gardening could be introduced in villages. Fruit and vegetable preservation industry could be encouraged as a side industry.

Better and sufficient food is the basis of progress. Efficient work and more production increase people's earning capacity. Better earning capacity gives them more purchasing power, which in turn raises their standard of living. Many other countries have made considerable progress by introducing modern techniques in their rural areas. It should not be difficult for India to do so with vast resources at her disposal.

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BETTER CROPS WITH

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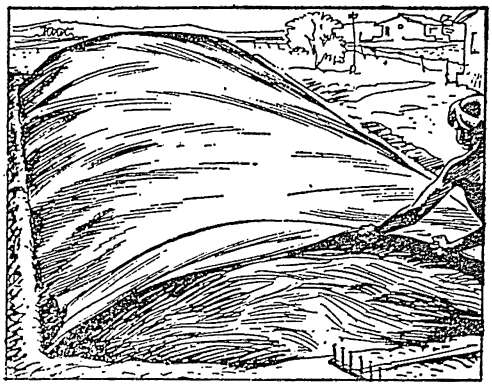
FILM ON THE FARM



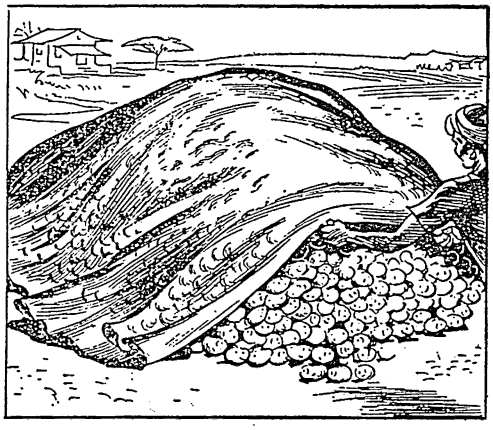
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Who wants more food ?

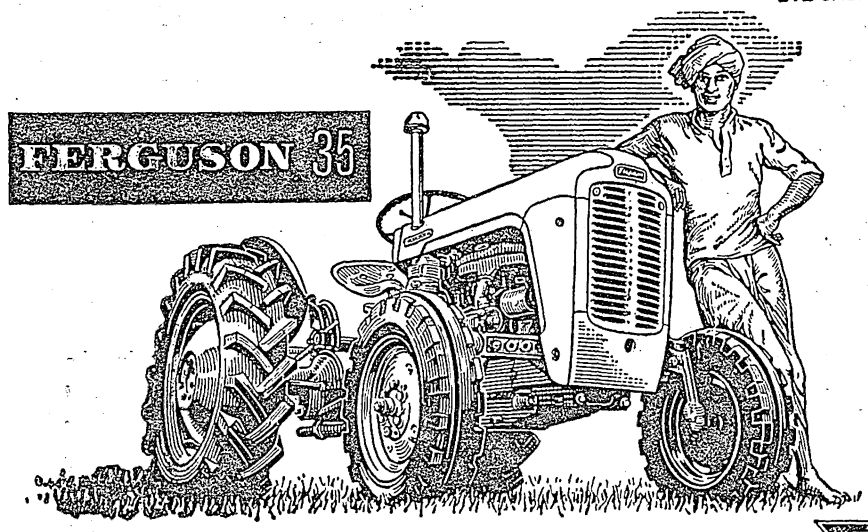
My basic job is to assist in raising this country's food production from its present low level—so low that we have to buy abroad.

The extent to which I can help is very often not realised—it certainly is not realised enough.

Whether it is wheat or rice—gram or grass—sugar or groundnuts—whatever it is, only I can reliably and economically:

- Have the soil ready for the rains or water,
- Prepare the best tilth to suit the crop,
- Sow quickly and well on the right day,
- Give the crop attention whilst it grows,
- Harvest at the right time,
- Do, in time, all those never-ending duties such as agricultural haulage, soil conservation, water distribution and so on—which mean the difference between shortage and enough.

MECHANISATION MEANS MORE MEALS

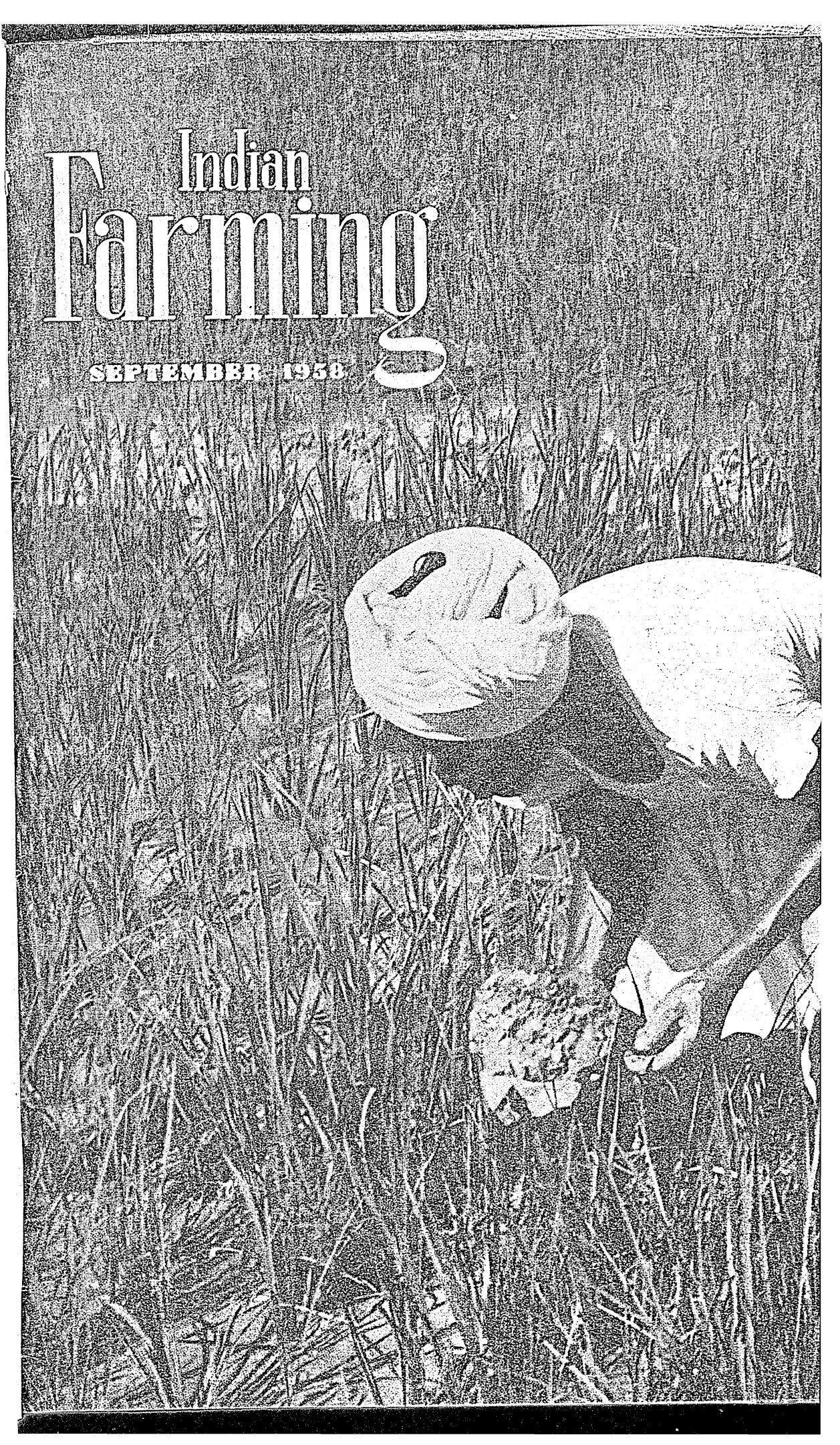


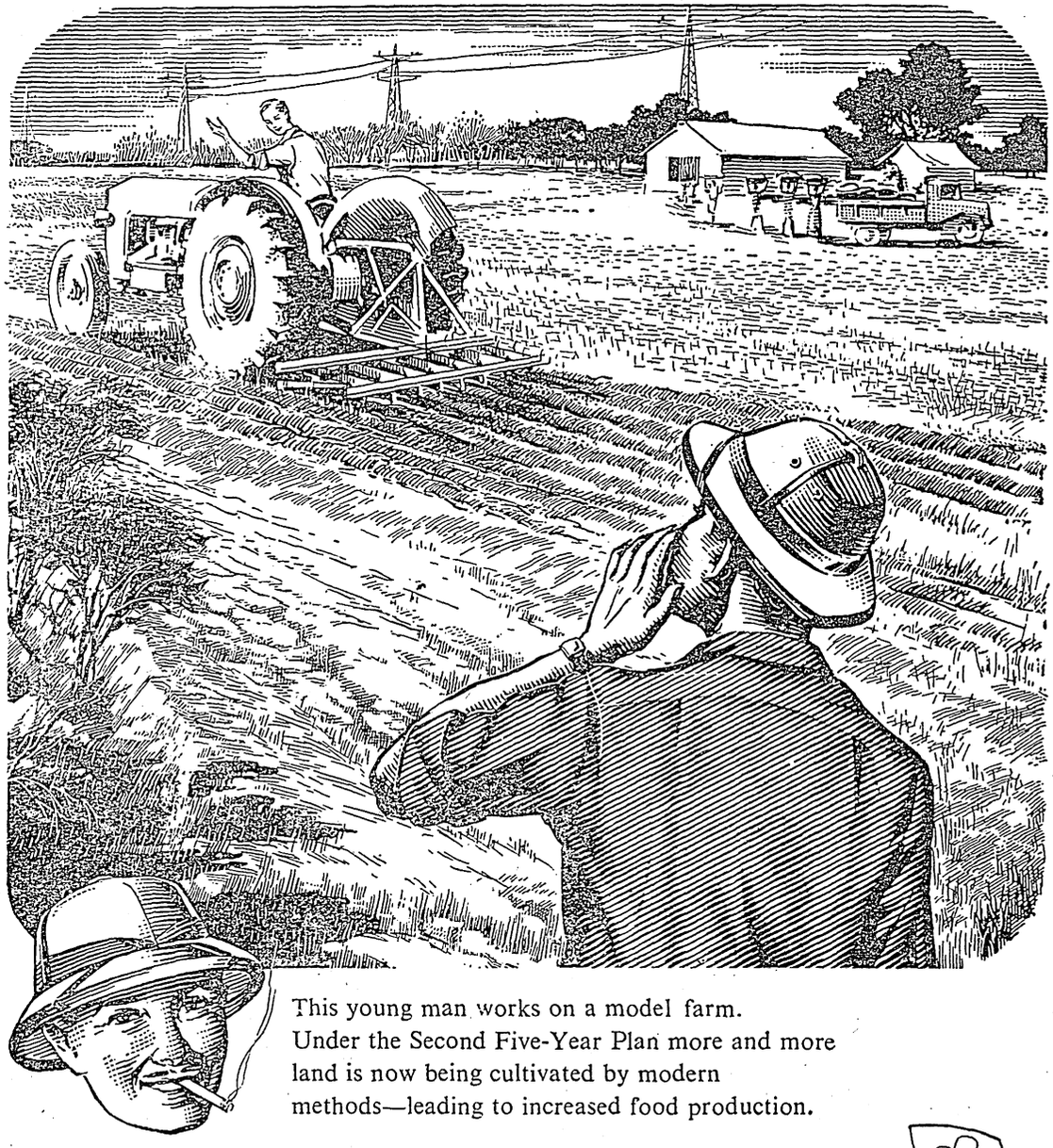
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Indian Farming

SEPTEMBER 1958





This young man works on a model farm.
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methods—leading to increased food production.

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OUR COVER



A farmer admires the lump of soil that has come up with the clump he has uprooted in thinning his rice crop. He has taken to placement of fertilizer in pellet form, and knows, as many other farmers do, that this will result in better rice-yields

Photo by H.K. Gorkha

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NEW DELHI

The land of my fathers—is yours!



Gramdan has been described as a great non-violent revolution of deep significance. So it is. Who would have thought, five years ago, that village landowners would willingly give away every acre of their land, and be happy to receive in return plots in proportion to the size of their families!

Life in India is changing for the betterment of the many. In the home, age-old prejudices and beliefs are being put aside. Where health and diet are concerned, more and more people now realise that to be nourishing, meals must be *balanced* and not merely filling. Planned to include vegetables, fruit and fish in season, a balanced diet is both healthy and economical.

Fats are an essential part of a balanced diet; they provide 2½ times as much energy as wheat or rice, and are carriers for Vitamins A and D. These body-building vitamins are essential to the health of growing children and hard-working adults. This is why the wise housewife turns to DALDA Vanaspati for her cooking. DALDA has as much Vitamin A added to it as there is in good ghee; 'Sunshine Vitamin' D is added too, making it a trustworthy vegetable cooking fat containing extra nourishment. And because it is an all-purpose medium good for cooking varied types of foods and dishes, DALDA is helping to set up a new concept in the kitchen.



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A CAMPAIGN FOR *RABI*

EIGHT states of the Indian Union, in addition to Delhi State, have planned to launch a campaign this *rabi* season for increased production of foodgrains.

IN THE true sense of the word campaign, all available resources, agencies and organizations will be fully mobilized so that conditions leading to the realization of the specified objective are created.

THE crops that have been selected for intensive attention are wheat, barley, gram and *rabi jowar*.

IMPORTANT items receiving special attention are: seed-treatment before sowing; fertilizer use; use of improved seed; sowing at the right time; proper method of sowing; preparation and cleaning of irrigation channels; use of improved implements for sowing, interculture and harvesting; timely detection and control of insect pests and diseases; roguing of standing crops.

TO MAKE the campaign effective, active co-operation and participation of farmers are being sought. On-the-spot guidance on technical matters and provision of the supplies needed are being arranged by the government.

THE Extension staff in the Community Development and National Extension Service Blocks will be reinforced by technically qualified men from agricultural colleges and agricultural research institutes and similar institutions. They will form themselves into 'Campaign Brigades.'

PROGRESSIVE farmers, farm leaders and farm organizations will also join in to contribute their mite to the campaign work.

EVERY farmer and farm leader will have plenty to do during this *rabi* campaign period. So that they may have the know-how, *Indian Farming* is issuing, with this number, a special supplement, containing, in brief, information pertaining to the various aspects of the crops chosen for the campaign. It is hoped that the practical hints contained therein will be of use to the Brigades as much as to farmers.

NEW BOOKS RECEIVED

Cotton Atlas of India, 1957

Issued by the Indian Central Cotton Committee, Bombay 1; price per copy, Rs. 15.

Co-operatives and Land Use; Electrical Fishing; Cocoa Statistics; Principles of Tenancy Legislation; Plant Protection Bulletin

FAO publications; copies in India available from the Oxford Book and Stationery Co., Scindia House, New Delhi; 17, Park Street, Calcutta.

Water for Industrial Use

A United Nations publication; copies in India available from Orient Longmans, Calcutta, Bombay, Madras and New Delhi; The Oxford Book and Stationery Co., Scindia House, New Delhi, and at Calcutta; P. Varadachary & Co., 3, Linghi Chetty Street, Madras 1.

Proceedings of the Eighth Meeting of the Standing Advisory Committee on Agricultural Credit

Published by the Reserve Bank of India, Bombay.

Report on the Marketing of Ghee and Other Milk Products in India

Price, Rs. 2.25; copies available from the Manager of Publications, Civil Lines, Delhi.

Review of the Co-operative Movement in India, 1954-56

Issued by the Reserve Bank of India; price, Rs. 3; copies available from the Administrative Officer, Department of Research and Statistics, Reserve Bank of India, Post Box No. 1036, Bombay 1.

Fertiliser Statistics—1957

Issued by the Fertiliser Association of India, 85, Sundar Nagar, New Delhi-1.



Shri Sukhram Singh

30 Acres and 7 Milch Cattle

by

M.G. Kamath

"YOU grow crops on a farm and get money ; instead of growing crops, you maintain milch cattle and still make money ; but, you grow crops and also maintain milch cattle, and you make *more* money from both."

This is how Shri Sukhram Singh Nakkai, a farmer of Mangalpur near Karnal town in the Punjab, put in a nutshell the benefit of mixed farming he has been following for the last two years.

Sukhram has 50 acres of land, carved out of what was a thick-matted waste land allotted to him as a displaced farmer by the government.

" One good thing," Sukhram said, " is that it is all in one block and hence I can manage it efficiently."

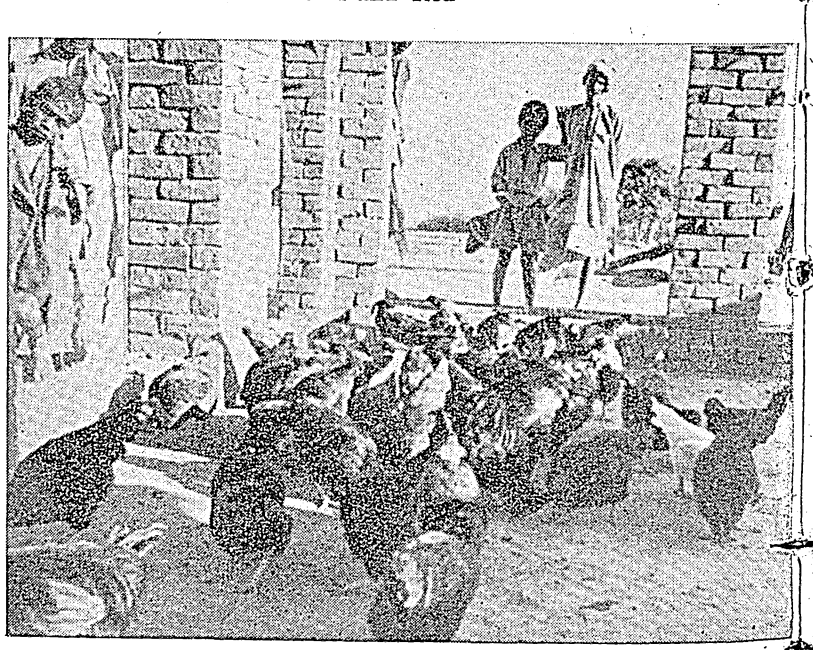
Of the 50 acres, 40 are irrigated and ten *barani.*

HANDY UNIT

But the farmer being intent on intensive farming, has kept 30 acres of the irrigated land under personal management and given out the rest on lease.

" These 30 acres with six Murrah buffaloes and a

"Nothing like a well kept poultry flock to bring in extra income," says Sukhram Singh. His favourite breed: Rhode Island Red



Sindhi cow make it a handy unit for me to manage," explained the farmer.

While most of the land goes to the raising of wheat, sugarcane and rice, a part of it is devoted to fodder crops, mostly berseem, but also maize and millets.

" This is how it works out," Sukhram further explained. " Fodder crops go to feed the milch cattle, the milk fetches me cash, the manure produced by the cattle goes to the fields and is principally responsible for the good crop-yields I get."

Electricity being available, the farmer runs a small rice mill. The by-products available by milling the rice of the villagers go as supplementary feed to his cattle.

Being near the town, Sukhram has no problems regarding the disposal of milk. He delivers milk right at his door to the vendors who sell the same in Karnal town.

GOOD MANURING

Sukhram's rice gives him 40 maunds to the acre. This, he thinks, is mostly due to the good manuring he does. " Good farming is good manuring," according to him, and the minimum farmyard manure per acre that goes to the rice fields is 40 cartloads.

Asked whether he had heard of the Japanese method of rice cultivation, he said that not only he had heard of it but also tried it on half an acre last year and got a yield of 53 maunds per acre. But due to labour scarcity he could not extend the area any further this year.

For wheat and sugarcane, the farmer lays stress on the use of good seed as a way to good yields. He grows the *No. 518* variety of wheat. " This one factor is responsible for giving me an additional six to seven maunds of grain per acre," was his comment.

TWO VARIETIES

He grows two varieties of sugarcane, *Co. 113* and *Co. 112*. Why two varieties? Because *Co. 113* is priced high by the mills for its good sugar content and *Co. 112* is good for *gur*-making, was his answer.

I asked Sukhram why he was not using fertilizers. His reply was that his being a virgin land it was moderately rich, but he was aware as an experienced farmer that this would not last long. As such, he had started making use of fertilizers.

This year, for example, he had applied three maunds of ammonium sulphate and three maunds of superphosphate per acre to the sugarcane crop. He had plans to extend the fertilizer use to the other crops too.

POULTRY FLOCK

No good farm would be complete without a flock of poultry birds. So Sukhram maintains an experimental flock of 50 Rhode Island Reds. His plan is to get enough eggs just now for his home consumption, and so build up the flock that in the next few years it may turn out to be a very good paying subsidiary unit on the farm.

Considering that Sukhram had only two years to put his idea of mixed farming to test, what he has achieved is something to boast of, indeed !

Good sugarcane yields, because Sukhram Singh manures the crop well



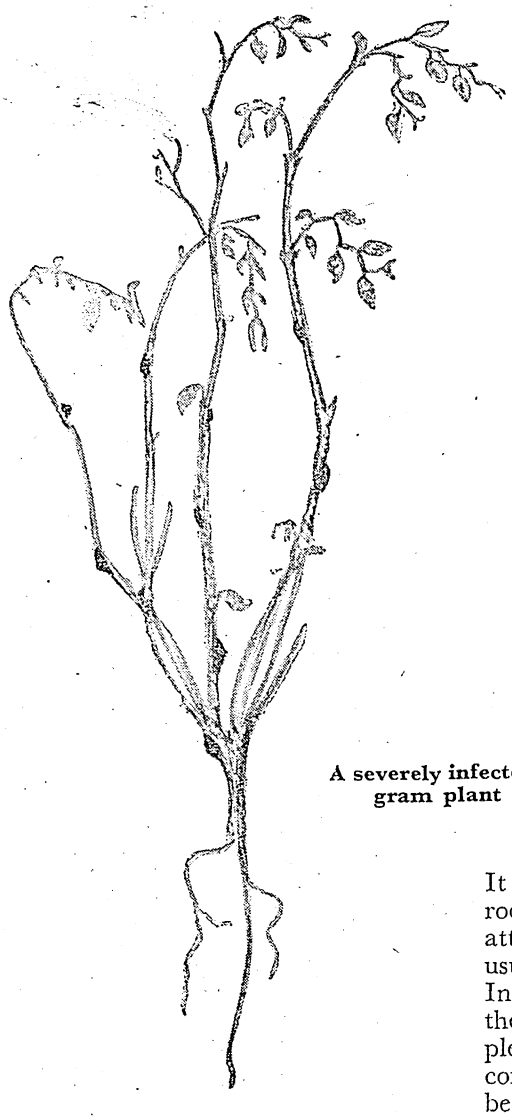
No Stem Rot Control, No Gram

by

Kishan Singh Bedi
Plant Pathologist, Punjab

and

Devindar Singh Chahal
Government Agricultural College
Ludhiana



A severely infected gram plant

YOUR gram crop may suffer heavy damage, or even fail to give you any yield, if you don't roll up your sleeves against stem rot.

Gram (*Cicer arietinum* L.) is the most important *rabi barani* crop of the Punjab State, next to wheat, and occupies an area of over five million acres. This valuable food crop is subject to a number of destructive diseases, and stem rot (*tane aur shakhon ka gal-sar jana*) is one of the most important.

Stem rot is caused by an aggressive fungal parasite, *Sclero tinia sclerotiorum* (Lib.) de Bary, and is confined to Gurdaspur, Hoshiarpur, Ambala, Karnal, Ludhiana and Jullundur districts of the State. The disease is favoured by low temperatures (15° to 25°C) and moist conditions of weather and soil.

The fungus attacks all the above-ground parts of the gram plant. It does not generally affect the roots. The main stem may be attacked at any point, but it is usually invaded at the soil level. In the early stages of their growth the infected plants may rot completely. In the case of older plants, complete to partial wilting has also been noticed. Shredding of the affected stem and branches is very common.

The first evidence of the disease is a patch, straw brown in colour. If cold wet weather continues for several days, the cottony growth of the fungus spreads on all the above-ground parts. The diseased plants first turn yellow, and thereafter, brown, and ultimately wilt and dry up.

Large, black, hard, resting bodies, the sclerotia are produced on the attacked plants, especially near the base of the stem which rots. The interior of the affected stem becomes packed with white mycelium, and black sclerotia may be seen by splitting it open. The sclerotia that are found inside the stem and the branches, are slender, elongated bodies, while those formed on the outside of the infected portions are almost as long as they are broad.

As the disease progresses, the fungus produces its sclerotia on the gram plants. Sclerotia may also develop on the soil surrounding the stems of affected plants if it is moist. These hard, resting bodies remain in the field in the debris of the diseased plants, which are generally left unharvested because they yield no grain. The fungus oversummers in the form of these resting bodies.

Next season, when the gram crop is grown in the same field which had borne a diseased crop, the sclerotia germinate by producing white mycelial growth in the cold and wet weather, and infect the plants in the vicinity. On these infected plants, white, cottony growth of the fungus soon appears and produces black sclerotia within a week to ten days. The disease spreads during the growing season of the gram crop by sclerotia or bits of mycelium, which may be carried by irrigation or rain water. Sclerotia get mixed with the seed during harvesting and serve as as ource of primary infection.

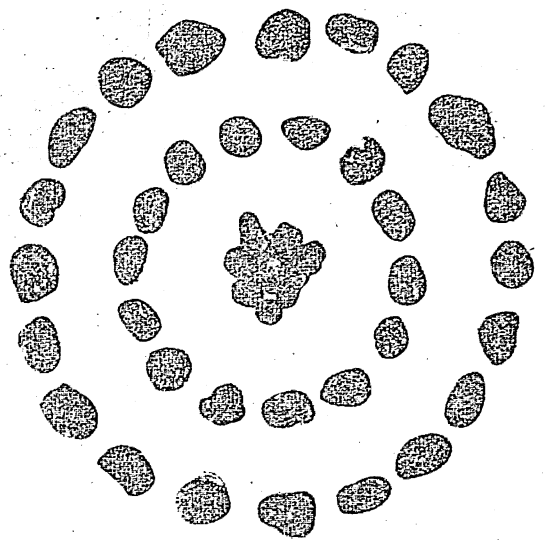
No gram variety has been found to be resistant to the disease. The selection or evolvement of a resistant variety of gram is an extremely remote possibility. The cultural operations outlined below should,

therefore, receive the maximum emphasis in the control of the disease.

Sanitation. Since the debris left behind in the diseased fields contains sclerotia of the fungus, its careful removal and destruction go a long way in reducing the incidence of the disease. Alternatively, the debris may be composted and the manure resulting therefrom applied to cereal crops, which are not susceptible to the disease.

Use of sclerotia-free seed. Gram seed should be obtained from a healthy crop free of sclerotia, or the seed should be freed from sclerotia by careful visual examination.

Deep ploughing and flooding. If sclerotia are buried one inch deep or more in the soil, they are killed. Sclerotia can also be killed by immersing them under water. For a thorough job, it is necessary to cover all parts of a diseased field with water after deep ploughing with an inverting plough. It is better to plough and flood the field rather than leave it fallow, because the sclerotia left on the surface are not killed by the summer heat.

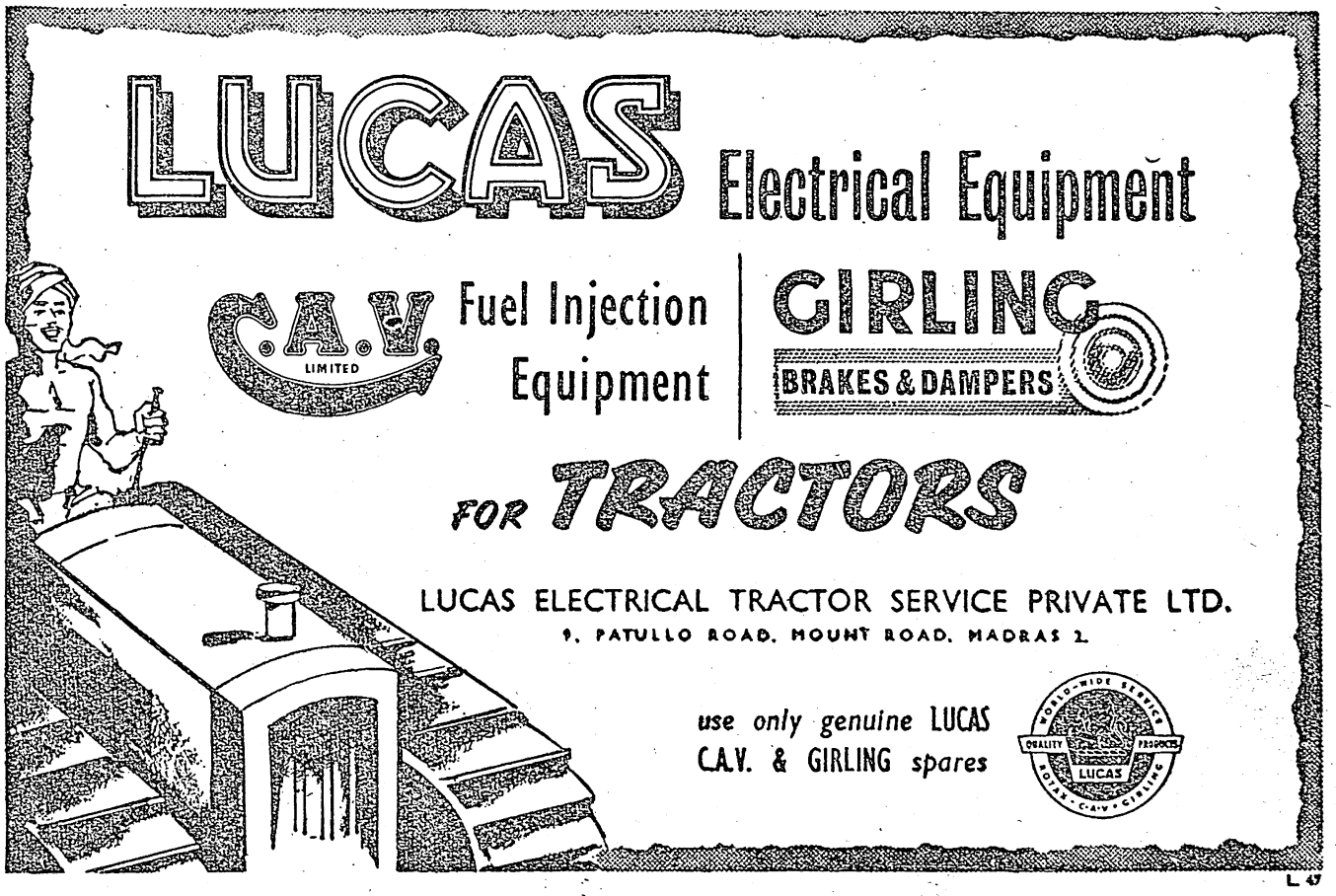


Typical black sclerotia collected from diseased gram plants

If water stagnates during the winter rains, it may be drained off. Do not sow gram in fields the drainage of which is not good.

Rotation. Since cereals are not infected by the causal fungus of the stem rot disease, a rotation with non-susceptible crops like wheat, barley and oats would be very effective. Where feasible, a rotation with the rice crop may be adopted as it proves very effective in reducing the infection to the minimum. This is because the cultural operations required to raise the rice crop include deep ploughing and subsequent flooding of the field practically throughout the growing season of the crop.

Stem rot also attacks berseem or Egyptian clover, which is a very valuable fodder crop in the Punjab. The same measures hold good in the case of that crop also.



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BAYER

Fertilizers Can't Harm the Soil *if you know how to use them*

by
P.C. Raheja
Indian Agricultural Research Institute
New Delhi

FARMERS, if they are a little careful in using fertilizers, will realize that far from damaging their soil they add fertility to it to give better crop production.

Fertilizers are of three kinds—acidic or sour, neither acidic nor alkaline (salty) and basic.

When acidic fertilizers are added to the soil they make the soil sour or acidic. Ammonium sulphate, ammonium chloride, ammonium phosphate, urea, anhydrous ammonia and ammonium nitrate fall under this category. Of these, the first three are strongly soil acidity-producing fertilizers. Other acidic fertilizers are superphosphate, muriate of potash and sulphate of potash. In case there is a high content of lime in the soil, the acidity of these fertilizers is neutralized and the soil remains sweet. It is, therefore, advisable not to use large doses of at least the first three on sour soils which do not have enough lime in them.

A typical member of the salty group of fertilizers is calcium ammonium nitrate (20.5 per cent nitrogen). This can be utilized on salty or sour soils with profit.

The third group, the basic fertilizers, are calcium nitrate, sodium nitrate, potassium nitrate and calcium cyanamide. When they are dissolved in water they leave basic material in the soil. These are, therefore, very useful on acidic soils. Their bases combine with the soil acidity and make the soil sweet.

If your soil is salty or alkaline, do not add a basic fertilizer to it. If you do, you will damage your soil.

CORRECT FERTILIZER

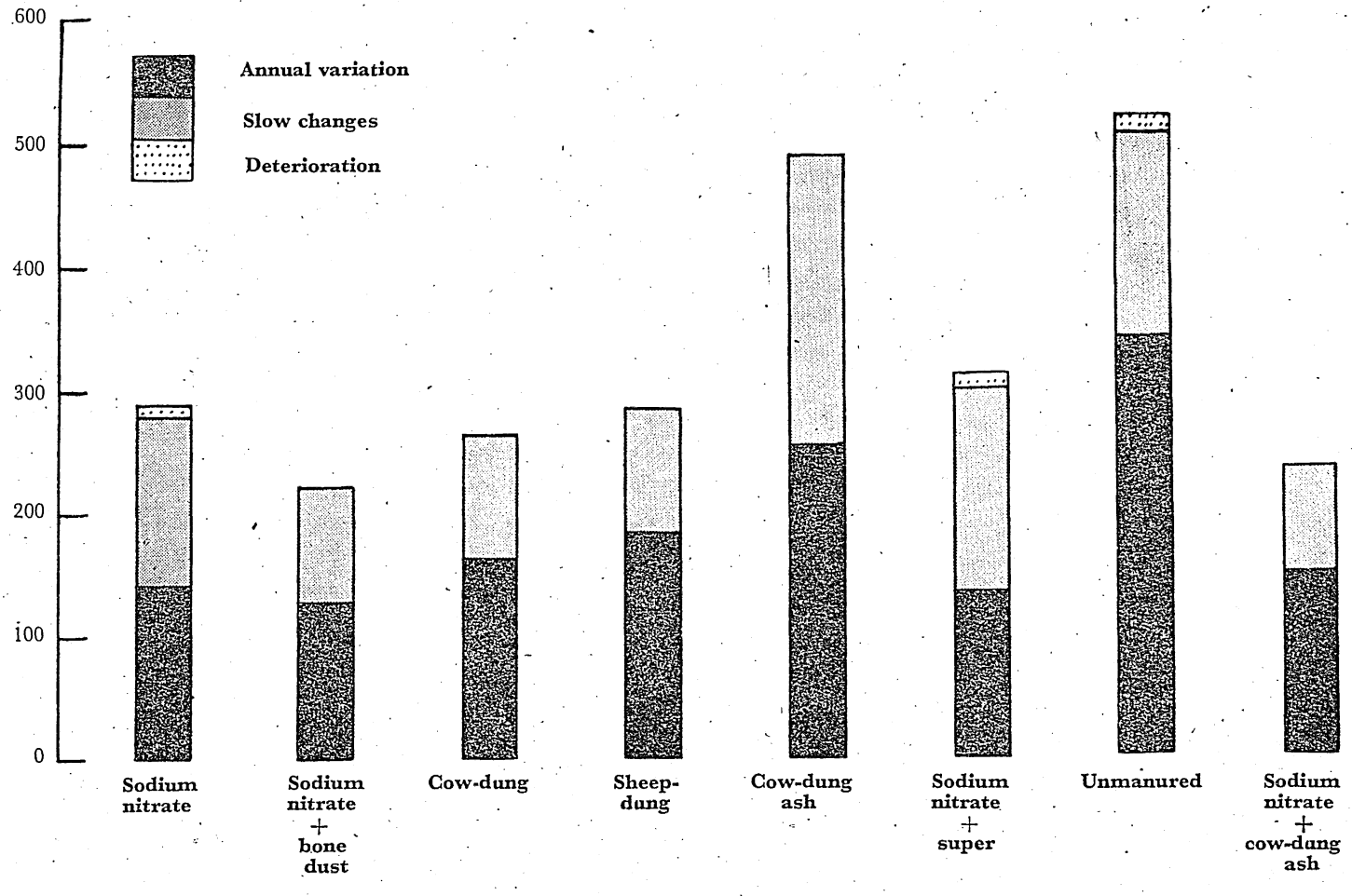
The soils of the Indo-Gangetic plain, black cotton soils and coastal alluvium are generally basic or alkaline in nature. Do not use basic fertilizers on these soils. An acidic fertilizer will suit them better. The soils of Kerala, Mysore, Madras, parts of Andhra Pradesh, the Konkan area of Bombay State, parts of Orissa, Assam, West Bengal and Bihar are acidic in nature. On these soils, use of basic fertilizers or fertilizers of low acid value is recommended. Bonemeal, which has insoluble phosphorus, is acted upon by the acidity of sour soils, and thereby it releases phosphorus for the use of crops. On the other hand, its use on a basic or alkaline soil would be of little value and a waste of money.

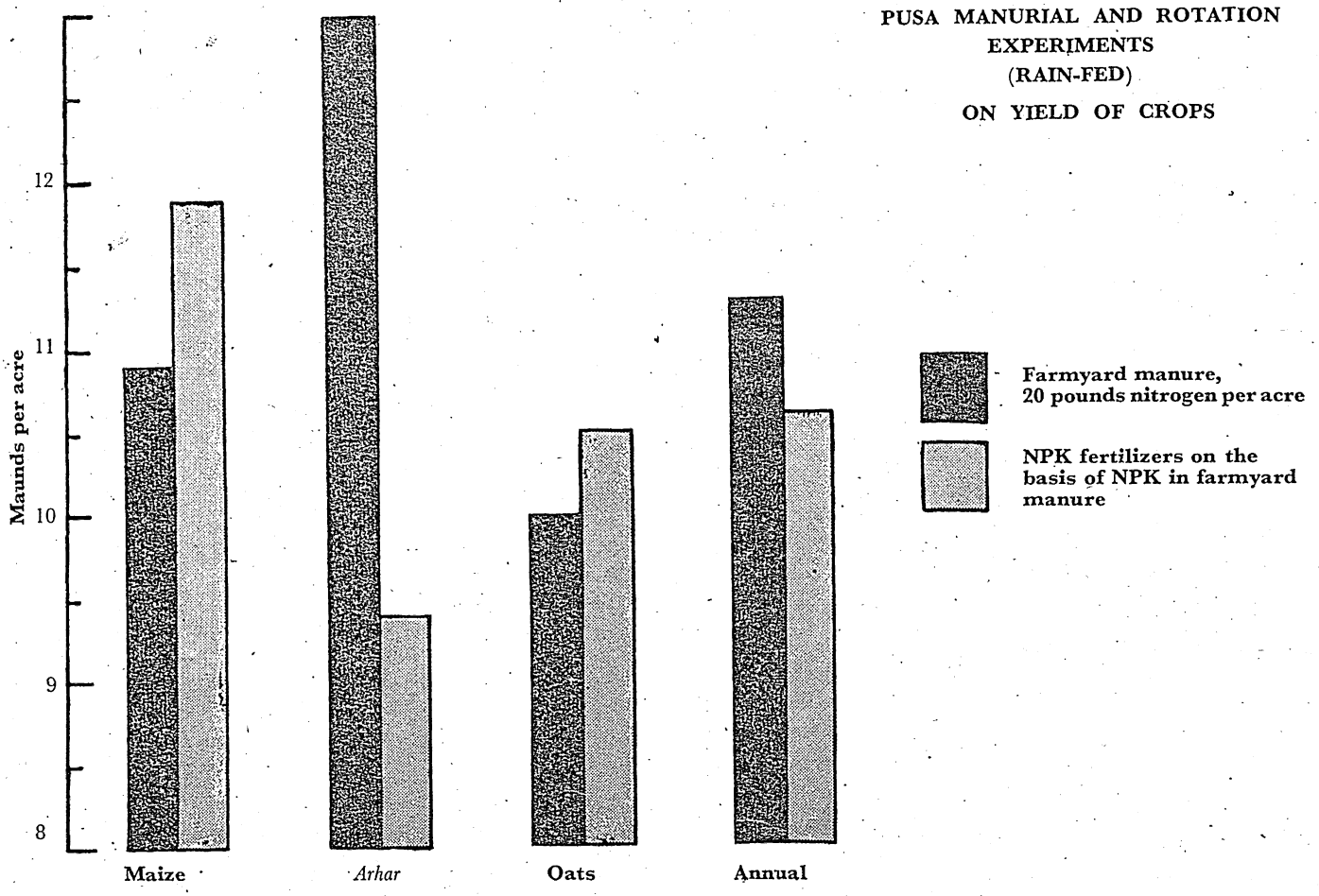
When a chemical fertilizer is added to the soil, some portion of it is absorbed by the crop and the rest combines with other chemical constituents. In heavy soils, which contain small amount of lime, a constant use of acidic fertilizers makes the calcium of the lime to combine with the acid residue. If the calcium in combination be leached out into the subsoil under heavy rainfall conditions or under irrigation, the heavy soil tends to harden further and cultivators complain that their soil has been damaged. To avoid such damage, use fertilizers like calcium ammonium nitrate, urea and ammonium nitrate, which are less acidic ; the soil will not run out of lime and will remain workable and in good heart.

Under certain circumstances, use of fertilizers may lead to excessive decay of organic matter in the soil. This is likely to happen in lighter soils. When the organic matter decays out quickly the soil becomes still more light. To avoid this damage, use small doses of fertilizers at frequent intervals, so that plants may absorb the plant food without producing any ill effects on the organic matter of the soil.

Thus, a wise use of fertilizers is essential to avoid any damage to the soil. Use the right type of fertilizer for your soil, and in small but adequate doses at the proper time. Addition of organic matter to the soil usually corrects any ill effects produced by chemical fertilizers. But where the soil has already been damaged, better consult your area Soil Testing Centre. These centres have been organized in all the states by the Indian Agricultural Research Institute in co-operation with the Indian Council of Agricultural Research and the State Departments of Agriculture.

VARIATIONS IN WHEAT YIELD DUE TO DIFFERENT MANURIAL TREATMENTS





At several Agricultural Experiment Stations in the world, comparisons of organic matter and fertilizers, extending over long periods, have been carried out. The first such long-term experiment was started at Rothamsted in Great Britain in 1852, and is still continuing. Similar experiments to study the long-term effects of fertilizers on Indian soils were started at Kanpur, Pusa, Nagpur, Coimbatore and Poona. Some of these experiments were closed prematurely while others are continuing.

KANPUR EXPERIMENT

In the Kanpur Permanent Manurial Experiments conducted from 1885-86 to 1913-14, it was seen that the unmanured plot and the plot receiving cowdung ash showed much higher annual fluctuations in yields. The deterioration in yields was also more in the unmanured plot than in plots receiving treatments of sodium nitrate, bonemeal, cow-dung, sheep-dung + cow-dung ash, and sodium nitrate + cow-dung ash.

The slow changes occurring due to infestation of weeds, etc., were much smaller in soils of plots receiving sodium nitrate + bone dust and sodium nitrate + cow-dung ash. The combined changes were the least in these two plots, which proves that fertilizers at least are as good as cow-dung or sheep-dung.

In the Permanent Manurial Experiment series running at Pusa, Bihar, the yields from maize, *arhar* and oats were compared over a period of 22 years from 1908-9 to 1929-30. The application of farmyard manure was found to be specially beneficial for *arhar* which gave an extra yield of about 300 pounds per acre. In the other two cases, the yields were in favour of the N.P.K. treatment given on the basis of the N.P.K. content of farmyard manure rated at 20 pounds nitrogen (100 pounds ammonium sulphate) per acre. A comparison of the annual yields revealed a very small difference between the fields from soils differentially treated with farmyard manure and complete fertilizer. Obviously, there has not been any appreciable deterioration in yields or damage to the soil by the use of fertilizers.

PLEASE CORRECT

In the article "The sterile cow that didn't remain dry" by Gian Singh and Gurcharan Singh, in the June 1958 issue of *Indian Farming*, on page 15 (col. 3, line 5 from above), the dose of "Stilbestrol Dipropionate" is wrongly mentioned as two ounces; it should be 2 c.c.

Our Trees

This is *Jarul*, the Colourful

by
M. D. Chaturvedi

IN regions of annual rainfall of 40 inches and over, the *jarul* stands out as a colourful timber tree with a short bole and big branches, arresting the attention of all and sundry.

It occurs freely in Assam, Bengal and along rivers and streams in eastern Uttar Pradesh. On the Western Ghats and in Kerala State, the *jarul* flourishes in tracts of high rainfall.

The tree avoids dry tracts, and where forced to grow, does not attain its usual size. It is a tree that prospers on well drained wet lands, more particularly in the alluvial soils along the river banks. Its growth is stunted in ill-drained swamps.

The *jarul* is not an evergreen tree. During the cold weather, its leaves turn a sort of pinkish red before falling. The tree remains leafless for quite some time in February-March. The crown is rounded, and the stem is covered with greyish smooth bark falling off in irregular flakes.

The *jarul* is known by a variety of names: *jarul*, Bengali; *ajhar*, Assamese; *taman*, *bondara*, Marathi; *hole-dasasal*, *challa*, Kannada; *pumarathu*, Tamil; *manimarathu*, Malayalam. In Latin, it is named by botanists as *Lagerstroemia flos-reginae*. It is named after a Swede: Magnus Lagerstrom, a friend of the great botanist Linnaeus (1696-1759). *Flos-reginae* stands for "Flower of the Queen."

The new leaves appear in April and May, and soon afterwards the tree is covered with clusters of gorgeous mauve flowers that make it look most attractive. The tree is in fruit at the end of the monsoon. The capsule-like fruits ripen by about February.

The winged seed is small, light, not all of which germinates. The tree starts yielding seed from a fairly young age.

The *jarul* is easily raised from seed in nurseries. The growth in the initial stages is rather slow. The development of young seedlings is best stimulated by keeping the plant free of weeds, and well irrigated.

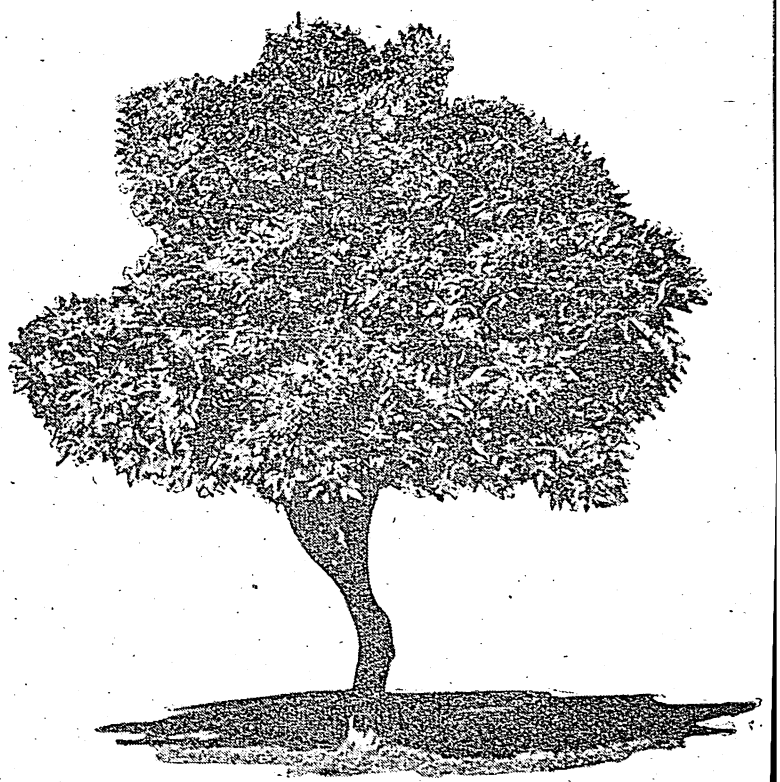
Jarul seedlings require protection against both frost and drought. The tree coppices well, and fairly large seedlings can be transplanted.

In nature, the seeds lie right through the summer, bursting into life at the break of the monsoon when carpets of seedlings can be seen around and close to mother trees, more particularly along the river banks where the seed gets washed to.

Since moist conditions are conducive to the growth of all vegetation, the *jarul* has to put up with a tremendous competition against weeds and other rival claimants for nourishment. Weed competition retards growth of the young seedlings and is the biggest single factor that arrests their development. It has a particular predilection for exposed, loose and bare soils with full overhead light.

Due to its light seed, the *jarul* is best propagated by raising seedlings in the first instance in well irrigated nurseries before transplanting them.

The *jarul* is prized as an ornamental tree and is planted in compounds of residential and public buildings, parks and camping grounds. For roadside avenues, it is too slow and requires long and careful nursing. It yields excellent and durable timber of a light red colour. It is used in building river crafts, carts, huts and houses.





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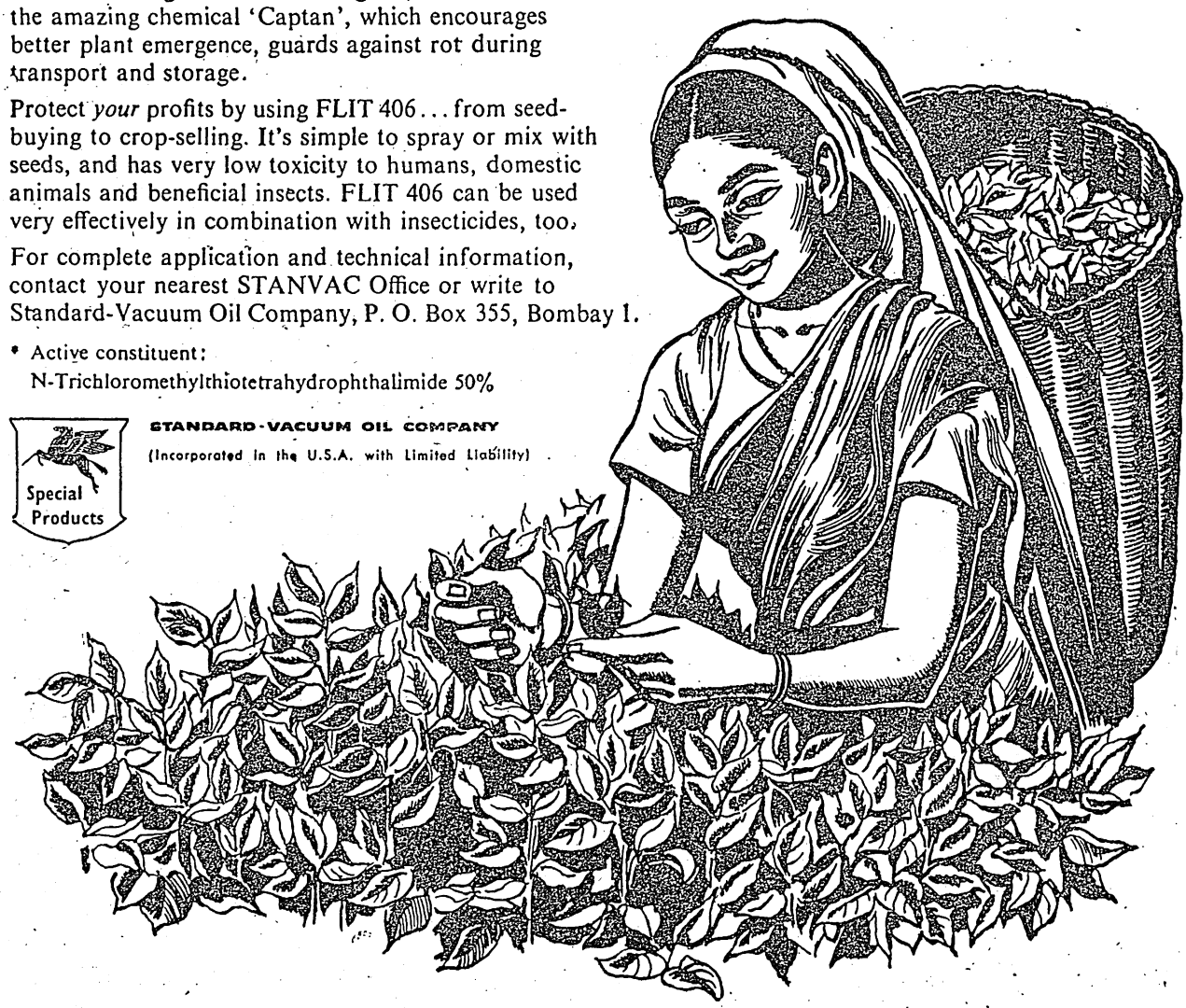
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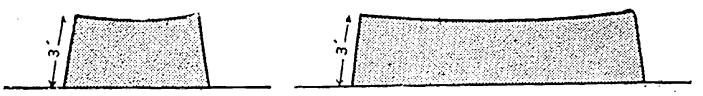


making the most of farm manure

by

Joseph Knecht, S. J.

A COMMON sight in our countryside, at least in north India, is manure heaped in a haphazard fashion in villages and fields. It has been proved that manure exposed to sun and rain in open heaps loses half of its value in a few months. Since our soil needs all that richness in manure to produce high quality crops, such a wastage through careless storage of this valuable possession of the farmer must be put an end to.



A manure heap as seen from one end (*left*) **and from the side** (*right*). **Such a heap may also be covered with a four-inch layer of soil**

What should the farmer do? He has not to buy any expensive equipment; he has just to observe method and care in his work. A well packed manure pile covered and kept moist would be ideal; in this way, fermentation entailing loss of nitrogen would not take place; there will be no loss of urine either. Urine because of its high nitrogen content is one of the most valuable forms of manure.

If ordinary manure turns grey in colour and at the same time is dry, it is a sure sign that molds have deprived it of its nitrogen.

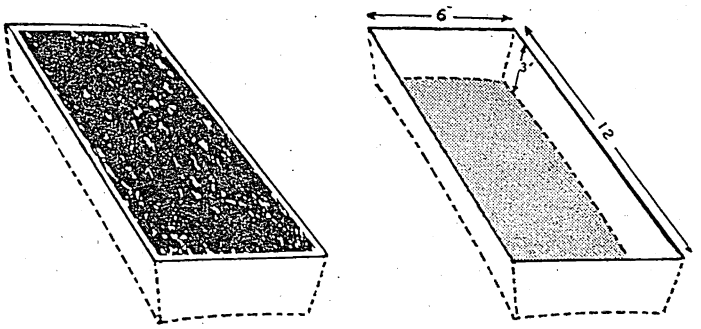
So if manure cannot be spread and ploughed or disked under immediately after it is collected, which may not always be possible, then preserve it for future use by one of the following methods.

Store it in a pit. The pit size would vary according to the amount of manure. The sides of the pit should be straight. If several pits are used, then the full ones may be covered with straw or earth.

If digging of pits is not possible, then make manure heaps in such a manner that the sides are nearly perpendicular, with the tops sloping towards the centre to avoid any run-off of urine. Again, a covered place is recommended.

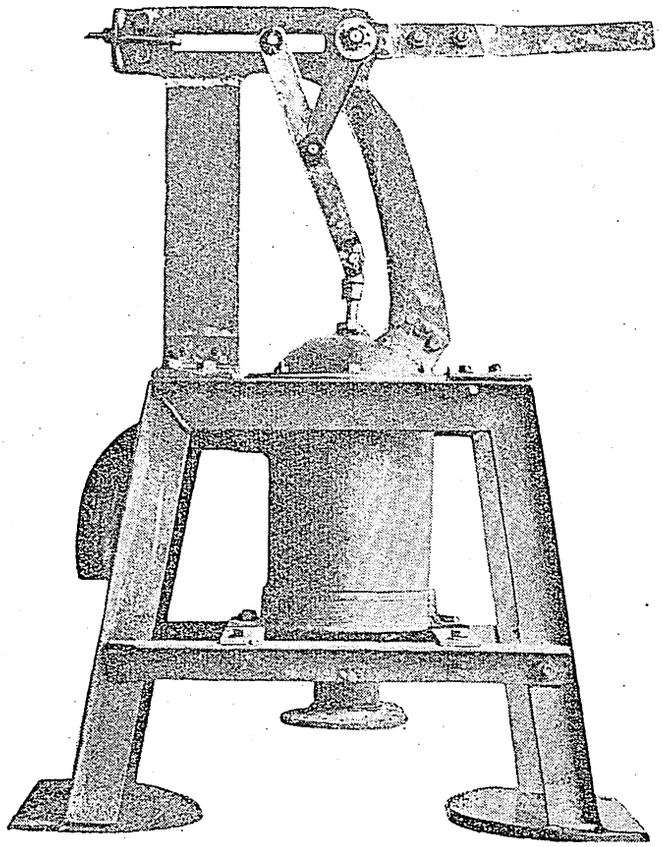
Finally, when the manure is placed in the field, plough it under as soon as possible to prevent loss of nitrogen in the air.

The extra care and time thus involved would be amply repaid by the manurial value saved.



A three-foot depth is good for manure pits. A pit when full should be covered with a four-inch layer of straw or soil (*left*) **and another pit kept ready** (*right*)

You Should be Happy with the Hand Pump



Being so easy to use, the portable hand pump is rapidly getting popular with Bihar farmers

by

M. P. Sinha

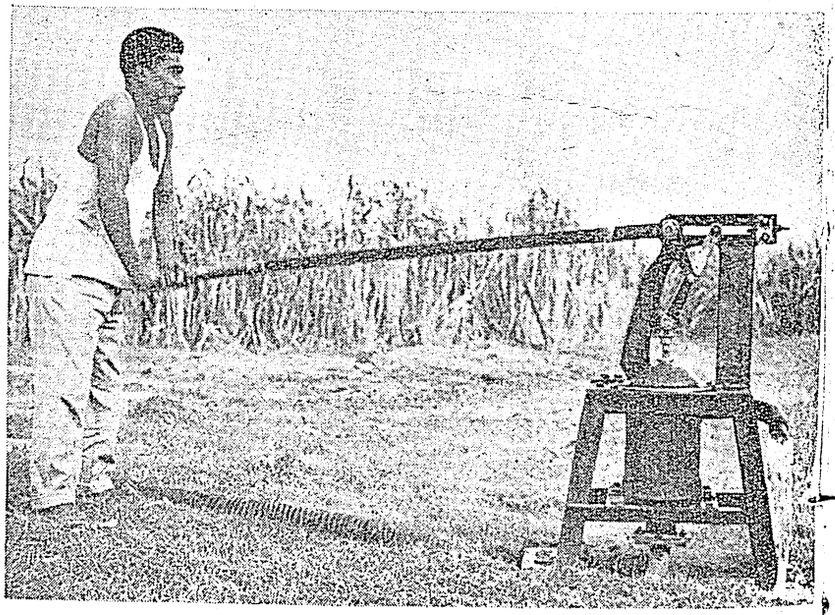
Agricultural Engineer (Research)
Bihar, Patna

A PORTABLE hand pump which the farmer can very easily use for lifting water has been developed by Bihar's agricultural department.

In the State, irrigation is an important problem that the farmer faces. An average farmer cannot invest money on costly pumping-sets. There is a dearth of bullock power also. Indigenous waterlifts like *karin* and swing baskets, though extensively used for lifting water from tanks, nullahs and road and railside ditches for irrigating the paddy crop, are not efficient, besides being limited in their use as they can lift to a maximum height of four feet only.

The portable hand pump devised by the agricultural department is a simple, single-acting bucket pump, operated by means of a lever through a linkage mechanism. The whole pump is mounted on a stand to make it portable and easily usable.

Fit it with a flexible suction hose, and lift water from any source

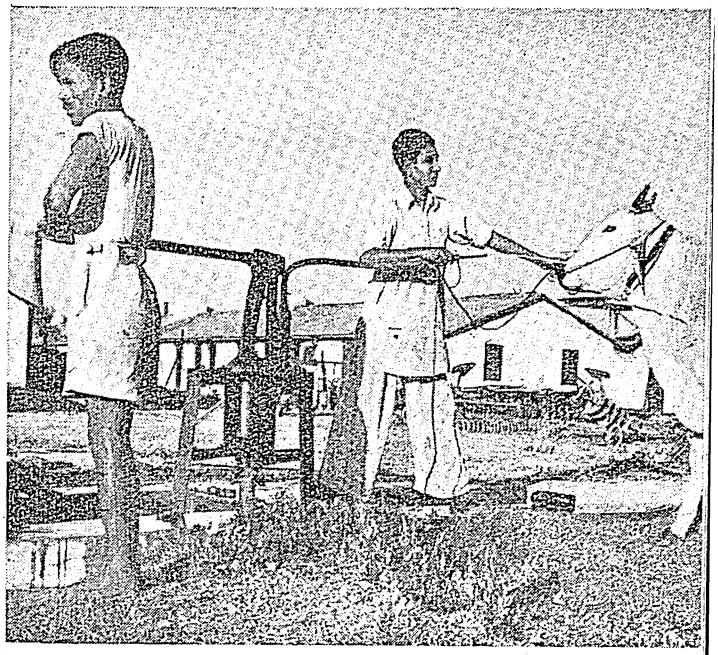


PUMP COMPONENTS

The pump consists of an 8½-inch diameter cylinder and a cast iron piston provided with a leather bucket,

and a disc valve. The disc is made of soft India rubber, 3/8 inch thick, and is provided with a valve guide. The piston is connected to the piston rod through the linkage mechanism which is operated by means of a lever. This mechanism is provided with a device to regulate the piston displacement up to a maximum of three inches. The suction-end of the cylinder is provided with a single-bit flat valve with a rubber pad. It is also provided with a three-inch pipe flange to facilitate its use in three-inch tube-wells or suction hose couplings.

The pump can be directly used in three-inch tube-wells, and also for lifting water from any other source where the suction lift does not exceed 20 feet ; it works best when the lift does not go beyond 12 feet. So that the pump could be used to lift water from different sources, a flexible suction hose would be useful. The pump can be used for pumping water into an overhead tank for domestic water supply in rural areas and also for washing tractors, animals or cattle sheds by providing a hose pipe with a nozzle fitted in.



Bathing animals or washing tractors or cattle sheds, a hose pipe with a nozzle is all that is required

NOT TIRESOME

The pump is worked by operating the lever, which can be done by one man ; another has to direct water in the field if water is lifted for irrigation. If the two interchange hands at intervals of an hour to 1½ hours, the operation will not be tiresome.

You can also pump water for domestic use into an overhead tank with this pump



The discharge of water varies according to the lift head, and also the capacity of the man who operates the pump. The man to man difference in discharge has been noticed up to 600 gallons per hour. The average discharge at ten to 12 feet suction lift is 1,500 gallons per hour. If, however, it is used for a maximum lift of four feet, as with a *karin* or a swing basket, the discharge will be about 3,000 gallons per hour.

BOON FOR FARMERS

With the stand, the pump will weigh only 135 pounds, and hence, two men can carry it easily from place to place. It would cost about Rs. 130, and should last for five years. The annual maintenance expenditure consists in the replacement of the leather bucket at a cost of Rs. 2.25.

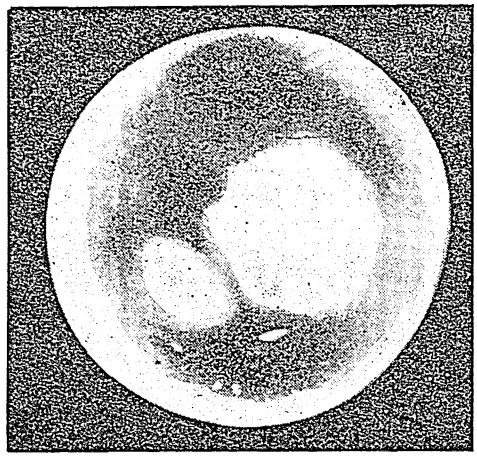
The pump, now named *Bihar Hand Pump*, will be very useful for a small farmer. It has been demonstrated on very many farms and supplied to farmers on a 50 per cent subsidy basis. Farmers have found the new pump very easy to work and a boon for irrigating their crops.

They've Found A Good Fish-breeding Ground at Pidrai

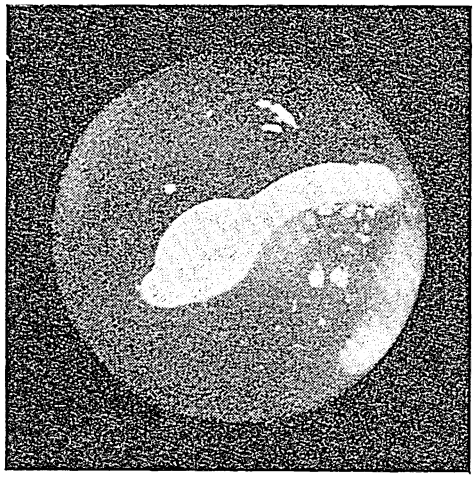
by

S.N. Dwivedi

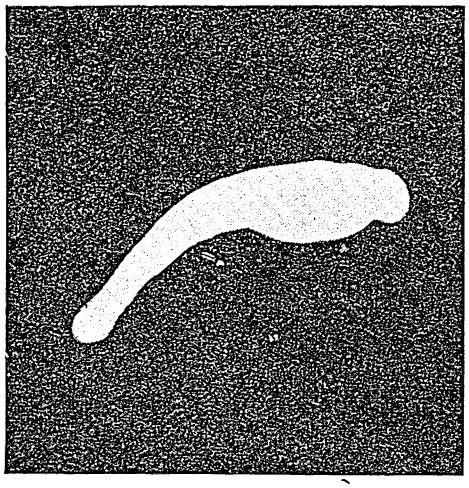
Assistant Fisheries Development Officer
Seoni



A developing egg



See the embryo inside the fish egg ?



And here's a hatchling (all magnified)

A FISH-BREEDING ground in the Garua Nullah at Pidrai, three miles from Goharganj in Raisen district, has been developed.

The major carps group of fast-growing fishes of India—*Catla, Rohu, Mrigal* and *Calbasu,* does not breed in enclosed waters. Hence, fish seed, eggs and fry have to be collected from rivers and nullahs, where these major carps breed, to restock tanks and ponds under fish culture.

Till recently, the requirements of the region were met from Bihar and Bengal, where a full-fledged fish seed trade exists. However, the long-distance transport involved in this has been adding to the difficulties and expenses.

The Garua Nullah is a seasonal rivulet which is dry for eight months in the year. It originates about two

Collecting eggs with a spawn collection net



miles south of the 31st milestone on the Bhopal-Bareli road from Jhilli. The Nullah has only an eight-mile long course. The watercourse is a part of the Gangetic river system which is rich in major carps.

The Nullah during its course flows through forests, plains and fields. At places, it becomes a narrow, deep channel, only a few feet wide, while at other spots it covers the entire vast slopes of the adjoining cultivated fields.

GOOD BREEDING GROUND

Round about the fields, small pits and depressions, bushes and tree stumps, all help to form a good fish-breeding ground. At two such places near Pidrai and Chopra, millions of fish breed every year; in the former, the breeding is comparatively more intense.

Every year, the Nullah gets flooded during the monsoon months of July and August. As a result, the fish come up the current from the main river and deep, stranded pools, which are their summer homes. They go up in search of suitable grounds for breeding. When they get to Pidrai and find extensive shallow areas there, millions of them start breeding there.

BEAUTIFUL SIGHT

It is a sight to see the fish at this time—the males and females running together with their backs and dorsal fins above the water surface, producing an audible sound when their bodies get rubbed against each other or against raised grass patches, bushes or tree stumps. At one time, villagers used to gather here to see and kill the fish with sticks, spears or swords. This practice has now been stopped by law.

The female fish leaves the ova and the male sheds milt. The eggs get washed down with the water from the fields into the main current of the Nullah, where nets for collecting spawn are fixed. The eggs accumulate at the end of the nets, called *gamchas*, and are carefully removed at regular intervals with a bowl. During the peak period, the collection is too big for a man to operate even a single net. The eggs have to be removed every three to four minutes, the rate of collection being 1,300 eggs per net per minute.

SIEVING

The eggs thus collected are transferred from *gamchas* into a sieve of 3.5-millimetre diameter holes, partially immersed in the water, to remove the unwanted varieties from them. Those which go through the sieve are discarded and those retained on the sieve transferred to a *happa*—a rectangular cloth storage tank, fixed close by in the slow current of the Nullah.

Eggs from the *happa* are transferred into a series of hatching-tubs which have a regular flow of water. Each series generally consists of a feeding water drum, 12 hatching-tubs being connected to each other with rubber tubes. Each tub, $2\frac{1}{2}$ feet x $2\frac{1}{2}$ feet x $1\frac{1}{2}$ feet, has two cloth nets, an inner and an outer one. The inner one is made of fine round-mesh mosquito cloth, and the outer one of *malmal*. A constant current of water is maintained in the tubs by the syphon system, so that the supply of oxygen for the developing embryo in the egg may be sufficient.

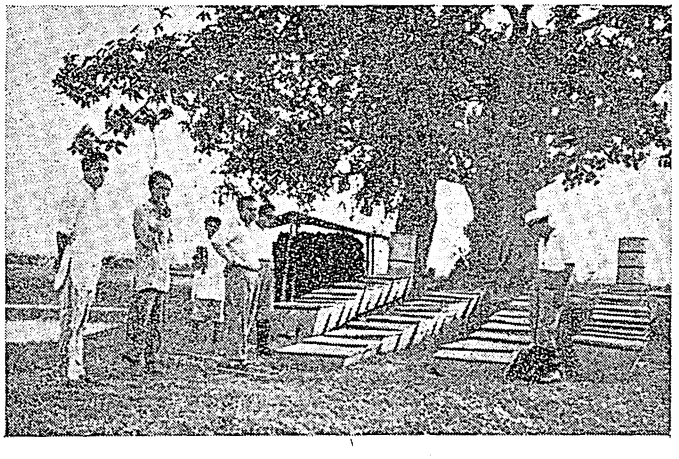
A DELICATE JOB

The process of hatching, though simple, is a very delicate operation. The eggs could be spoiled by even the slightest irregularity. There has to be vigilance round the clock to see that all the syphon tubes work at a uniform rate, that they do not get blocked or choked and the tubs do not overflow. Tubs in which mortality is noticed have to be removed from the series or the syphon made blind, so that the polluted water does not go to the other tubs in the series.

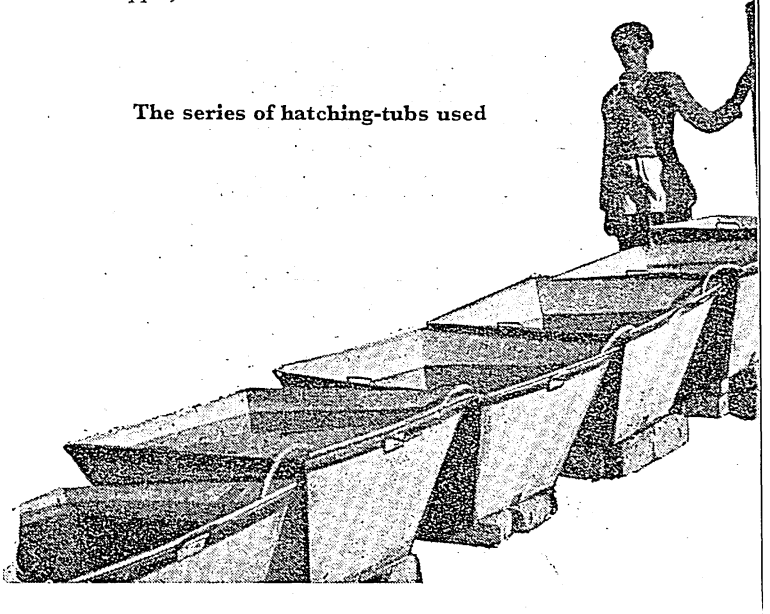
The time required by the eggs to hatch in the *happas* depends upon the stage at which these are collected and stored. At the centre, it is eight to 15 hours.

On hatching, small, slender larvae, five to six millimetres in length, come out of the eggs and wriggle through the mosquito netting into the outer *happa*. After about 20 hours, all the hatchlings would have wriggled out, leaving the egg membranes behind in the inner *happa*; the latter is then removed.

Hatching of eggs in progress at the Pidrai Centre



The series of hatching-tubs used



On the third day, the hatchlings are stocked in heavily manured and previously prepared nursery ponds. The ponds, of course, should be rich in plankton content. One cubic centimetre of plankton filtrate for every 12 gallons of water filtered through a plankton net made of fine muslin cloth is considered to be sufficient.

REARING IMPORTANT

The rearing operation in nursery ponds is very important, because on this depends the ultimate survival and yield. To achieve this, the ponds should be small—30 feet x 30 feet x six feet, preferably with a gradient of 1 : 2 for the sides.

All marginal, emergent, floating and submerged vegetation should be removed except the fine grass turf to check the erosion of the sides of the pond, especially when it is a black soil.

The predatory or otherwise harmful fish population should be removed from the pond by poisoning with derris powder in suitable doses a month before the pond is stocked.

The pond should be manured at a 1,000 to 1,500 pounds of cow-dung per acre.

By repeated netting with a fine-mesh dragging cloth, or by applying mustard oil soap emulsion, all insects like notonectids, waterbugs and stick insects should be removed. The mustard oil soap emulsion has three parts of mustard oil and one part of soap by weight. This emulsion should be sprayed on the water surface 24 hours before stocking, when it will effectively kill all notonectids which are great enemies of the fry.

The fry should be fed on artificial food like powdered oilcake and rice bran. The rate of the artificial food should be: for the first five days after stocking, twice the weight of the fry stocked; from the sixth to the tenth day, thrice the weight of the fry stocked; from the eleventh to the fifteenth day, four times the weight of the fry stocked.

Normally, the fry in the nursery pond grow to an inch in length within about a fortnight. They are then transferred to rearing ponds, or directly stocked in tanks.

The Pidrai collection centre is working well and should be able to meet the entire requirements of the Bhopal division.

YOUR QUESTIONS AND SUGGESTIONS ARE WELCOME

Address them to the Editor

INDIAN FARMING

Indian Council of Agricultural Research
Queen Victoria Road, New Delhi-2

MINERAL SUPPLEMENT

MANY animals do not improve in condition in spite of good feeding. This is often due to mineral deficiency in the diet. As the fodder in this country is often deficient in minerals, it is essential to add a mineral supplement to the feed to make up this deficiency, or allow the animals to lick their requirements from a mineral brick.

The following products are most suited for this purpose:

(a) 'Churn' brand Protective Mineral Supplement 105—to be given mixed in the mash daily.

(b) 'Churn' brand Mineral Brick—Each animal will lick whatever quantity it requires.

YOUR animals will improve in health and you will thus get better and more milk from your cows and goats, more and bigger eggs from your poultry and better work from your working animals.

Ask your Veterinary Doctor

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ICY—446

Two Jaipur Farms Find Good Use For Sewage

by

R. P. Talati

Compost and Sewage Development Officer
Ministry of Food and Agriculture
New Delhi

TWO sewage farms of Jaipur have been yielding five to six times their normal revenue since a scheme for a better utilization of the city's sewage was completed ; the sanitation in the city also is now much better.

The sewage of Jaipur which has partial sewerage system, flows out at two places—one on the north and the other on the south of the city. From there, it was utilized on two sewage farms : one of 50 acres on the northern side and the other of 30 acres on the southern side.

On account of narrow by-lanes, proper conservancy arrangements could not be made and removal of night-soil was extremely difficult. As a result, the sanitation of the city was suffering.

After making certain preliminary observations, it was found possible to frame a suitable scheme for meeting the problem not only of the sanitation of the city but also for utilizing the night-soil from the different streets of the city in a scientific manner on the farms.

The estimated cost of the scheme was Rs. 5.5 lakhs which included provision of sewerage in two of the thickly populated *chowkries* (about 50,000 population) known as Bishweshriji and Modi Khana and taking away of drainage from the city. The increased discharge was to the extent of two cusecs. The work of sewerage was almost completed in 1957.

To begin with, periodical samples at the outfalls were studied. It was seen that the free ammoniacal nitrogen from the northern outfall varied from 1.95 to 5.15 parts per hundred thousand, compared to 1.45 to 4.65 of that from the southern outfall. The suspended matter in the northern sewage varied from 76.5 to 280.6 parts per hundred thousand while in the southern sewage it varied from 44.5 to 220.4. Thus, the nature of sewage varied from weak to strong during the day's flow.

The soils on both the farms were generally loamy ; a number of soil profiles were, however, examined.

It was seen that the soils on the southern farm contained less clay and were lighter than those on the northern farm. The total soluble salt content in typical plots varied from 0.25 to 0.41 per cent in the case of the northern farm soils, and from 0.8 to 0.12 per cent in the case of the southern farm soils. The soluble salt contents tended to reduce with increase in depth.

The southern farm had a good natural drainage in a well defined deep nullah. The northern farm was almost a flat area with no natural outlet.

The northern farm had developed signs of sewage sickness, as judged from the accumulation of salts in soils and also from high water-tables ranging from four to eight feet in some 17 wells situated on the farm. An examination of well waters showed a high concentration of salts in most of them. Most of these wells were not pukka built and the sewage water let out for irrigating the crops had direct access to these wells when it was surplus.

There was only one well on the southern side. The water level in this well was very deep, over 30 feet from ground level, and its water comparatively much better.

On the northern farm, four wells could be considered suitable for irrigation, three were on borderline and the rest unsuitable. The well on the southern farm was also suitable for irrigation. The nitrate contents were very high, up to 2.5 per cent.

It was decided to give the northern farm, which had developed sewage sickness, rest and the following cropping pattern was recommended.

Kharif season	Light seasonal crops
Rabi season	Light vegetables
Hot weather	*Dhaincha* green manuring

After following the above crop pattern for about five years, it was considered that the soil would recoup if suitable well water with a high nitrate content was used.

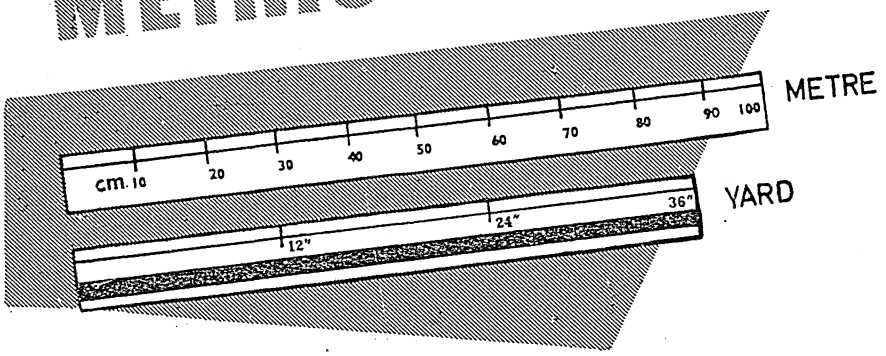
A new adjoining area was also surveyed for utilizing the sewage water. This area had been lying fallow for a number of years. Contour levels were taken and it was found that outlet channels could be taken there by gravity and without lift. So the farm was extended from 50 to about 150 acres.

As regards the southern farm, as it did not show any signs of deterioration three additional wells were provided to dilute the sewage water. Three more outlets were also provided for irrigating the surrounding fields. As a result, the farm which was formerly of about 30 acres has now extended to about 150 acres.

The northern farm which fetched a revenue of Rs. 850 before 1954, is now fetching a revenue of Rs. 6,000 annually. The soil improvement in the old farm has to be watched carefully. The southern farm which was fetching a revenue of Rs. 6,900 has now been fetching a revenue of Rs. 26,030. It is expected that this revenue will be maintained and may even increase in the years to come.

Jaipur is a fast-growing city. The water supply is proposed to be increased to about ten million gallons per day in the next two to three years. It is expected that these reorganized farms would consequently be of the sizes of 350 acres on the north and 750 acres on the south. It is also expected that by then the authorities would have been able to put up a pre-treatment plant for the sewage.

WHAT IS THE METRIC SYSTEM ?



The Metric System derives its name from the Metre, which is the primary unit for measuring length. In this system, as in all decimal systems, the basis of calculation is 10. We multiply or divide any unit of length, weight or volume by the same number i.e. 10.

In the Metric System, the multiples of a unit have the prefix *Deca* (10 times), *Hecto* ($10 \times 10 = 100$ times) and *Kilo* ($10 \times 10 \times 10 = 1{,}000$ times). The sub-units have the prefix *Deci* (1/10) *Centi* (1/100) and *Milli* (1/1,000).

THE CHANGE-OVER TO THE METRIC SYSTEM OF WEIGHTS AND MEASURES BEGINS FROM OCTOBER, 1958

KNOW THE METRIC LENGTHS

The primary unit of length is

THE METRE

=40 inches approx.
1 kilometre = 5 furlongs

SUB-UNITS

10 millimetres = 1 centimetre
10 centimetres = 1 decimetre
10 decimetres = 1 metre

MULTIPLES

10 metres = 1 decametre
10 decametres = 1 hectometre
10 hectometres = 1 kilometre

2

609/85 VC

ISSUED BY THE GOVERNMENT OF INDIA

Lucerne Solves A Hill Problem



Hardy lucerne holds out great promise in north Indian hills

by

S. P. Kohli
Wheat Breeding Substation
Simla

A MAJOR problem in the Indian hills is the finding of sufficient and nutritious forage for cattle. The land available for cultivation is meagre, the hill soils difficult to manage, and carrying of bulky feeds to these areas certainly not easy.

Grasslands form the only major source of forage during the rainy months of July to October. But, thereafter, summer grasses stop growing, and November to June are very lean months. Hence, cattle have to be fed on dried summer grasses of poor nutritive value.

Lucerne seems to have now provided a solution to this problem. Of the numerous annual and perennial forage legumes and grasses grown at the Wheat Breeding Substation of the Indian Agricultural Research Institute at Simla, this crop has been giving excellent results.

In plots sown with seed, the lucerne crop gave about four cuttings from June to October, and an additional two cuttings during the winter and spring. These plots yielded about 500 maunds of forage per acre ; on the uncultivated slopes, where it was tried as a mixture with summer grasses, the yield was 600 to 700 maunds per acre.

It was also seen that lucerne was almost unaffected by the cold and comparative drought of the winter months, particularly during the second and the subsequent years. This is because lucerne seedlings have a long root system which penetrates deep down into the subsoil. Short of a heavy snowfall, the top growth of the crop remained unaffected even during severe, killing frosts. In the three years subsequent to the year of seeding, in all about six cuttings were obtained without in any way depleting the stand of the crop.

Punjab Lucerne Type 9 was the variety used in these studies. The grass-lucerne mixture grown on the cultivated slopes, when air-dried, showed a protein percentage of 26.95 as against 13.47 of air-dried hay samples ; the protein content of the hay made from lucerne alone cut in the winter was 30.10 per cent. This shows how nutritive green forage or hay of lucerne could be.

WASTE UTILIZED

The grass-lucerne mixture grown on the slopes benefited from the manuring and fertilization of the intervening cultivated terraces ; this was apparent from its growth and yield. This means that the soluble soil nutrients of the hill soils, which normally are wasted by leaching, would be put to a good use in this way.

Of course, under the existing conditions, it is not possible to grow lucerne in areas where cash or foodgrain crops are limited, except

under orchard conditions. Hence, attention was paid in the trials to growing of lucerne on the uncultivated slopes of the farm area given to grass.

BETTER TRANSPLANT

Lucerne seed sown in grass stubble during the summer rains failed to give a good crop stand probably because the seed-bed was not properly prepared. But when seedlings raised in a nursery were transplanted in the grass stubble during the rains they came up very well on the slopes, in spite of some slopes being almost 90 degrees.

During the summer months, the growth of lucerne was quite satisfactory. During the winter, especially in the second and following years, the crop came up so well that it gave a good, tender, fresh and dark green growth at a time when natural grasses had gone dormant. Thus, lucerne gave at least two additional cuttings at a time when forage was scarce.

SUITABLE MIXTURES

In the Simla hills, species of *Pennisetum*, *Andropogon*, *Panicum* and *Erianthus* are the commonly grown grasses. They grow fairly tall during the summer months and crowd about the plants of lucerne grown mixed with them. But the short-growing species such as *Pennisetum* (*P. flaccidum*), *Setaria*, *Agrostis*, *Afena*, *Cynodon*, *Phalaris*, *Eragrostis*, *Ischaemum*, *Paspalum* and *Bromus* form very suitable mixtures with lucerne as they do not overcrowd it in summer. Of course, the cold weather completely checks the growth of these grasses in the winter.

Lucerne being a hardy perennial, once established it stands for many years. It is a deep-rooted legume and as such checks soil erosion. It also resists drought and cold weather conditions with its suitability for use as green forage, ensilage, haymaking, green-manuring, and as a honey-yielding crop.

Cultivation of lucerne should be encouraged, especially in the north Indian hills where it has shown special promise under severely cold and dry weather conditions.

The Eucalyptus that Came to the Plains

by

K. Kannan
Agricultural Research Station
Ambalavayal

AN important essential oil-yielding plant has been grown with success at the Agricultural Research Station, Ambalavayal, Kerala State. It is *Eucalyptus citriodora* Hook, a species of eucalyptus.

Eucalyptus belongs to the natural order Myrtaceae which consists of more than 300 species, all natives of Australia. A number of these species have been tried in the Nilgiris, but only *Eucalyptus globulus* (bluegum) has so far been exploited commercially.

At the Ambalavayal Research Station, situated at an elevation of about 3,000 feet, a few species of eucalyptus including *Eucalyptus citriodora*, *Eucalyptus robusta*, *Eucalyptus rostrata*, *Eucalyptus crebra* and *Eucalyptus globulus* were tried. Of these, *E. citriodora*, first introduced in 1880 into the Nilgiris, was found to be the best. The tree vigour and the oil yield of this species were found to be highly satisfactory. In a short period of ten years, it has proved itself to be highly promising under the climatic conditions of the region.

FRAGRANT OIL

E. citriodora is grown in many parts of south India such as the Anamalais, Yercaud, the Nilgiris and parts of Mysore. In these areas, however, the tree has been grown more for fuel and as a wind-belt than for its oil. Its value as a yielder of a useful and fragrant oil was not fully realized till recently.

Eucalyptus citriodora is a handsome, evergreen tree growing more than a 100 feet high. It is upright and slender, and branches high up from ground level. The branches are pendulous and the leaves, from which the lemon-scented oil is obtained, are narrowly lanceolate, curved like a sickle and dark green with prominent oil dots on the upper surface of the lamina. The bark is smooth and brown, and peels off completely, leaving the smooth, ashy white wood exposed, the flowers are borne in panicles with individual flowers on long pedicels. The calyx is bright green and united into a narrow cup ; stamens are numerous. The plant flowers in February-April.

E. citriodora is propagated by seed. The seeds are enclosed in semi-ovate fruits with depressed borders produced in clusters in large numbers. Inside the hard shell of the fruit are the seeds which can be easily extracted when well dried, each fruit yielding three seeds. After extraction, the seeds are again dried before sowing.

For raising a nursery, beds are first formed, then clods broken, and the soil pulverized, levelled and well pressed. The seeds are next sown and covered with a fine layer of soil. In the early stages, the nursery beds need to be shaded. An ounce of seeds will give enough seedlings needed for planting an acre.

The seeds take seven to ten days to germinate. When the seedlings are about 1½ months old, they are transplanted into seedling baskets ; a large percentage of the seedlings will die off if they are transplanted naked into the pits. The seedlings

are ready for planting out in the main field in six to nine months' time; seedlings older than that do not transplant well.

PLANTING OUT

The plant may either be grown as a pure crop or planted on the boundaries of fields. A spacing of 12 feet x 12 feet is about the optimum. At this rate, an acre will accommodate about 300 plants.

Three feet cube pits are dug with this spacing during February-March. The pits are next filled with a mixture of cattle manure and pot soil. In May-June, when there is sufficient rain, the seedlings in baskets are planted in these pits and shaded from the sun till they are firmly established, which they do in two to three weeks.

Gap-filling will be found necessary. As such, a few seedlings should be kept in reserve. Unless proper care is taken, seedling mortality will be found high.

Once the plants are established, they show quick growth. No manuring or cultural operations are normally needed, except to weed out beds once a year just before the monsoon.

DISTILLING OIL

The first cutting of leaves for distillation can be had in about the fifth year ; thereafter, two cuttings can be taken in a year. Ladders are used for climbing the trees and cutting down the leaves. The leaves are harvested along with small twigs, taking care to see that bigger branches are not affected.

The leaves are distilled immediately after harvest. But, it has been observed that even if the leaves are dried the oil percentage obtained is not reduced.

Distillation is done in country stills by the water distillation method. An ordinary copper still, having a container, a copper coil and a water tub for cooling is used. A medium-sized still, measuring five feet in length and seven feet in circumference, will hold about 150 pounds of fresh leaves per charge. It takes 1½ to two hours for the distillation to be complete. The oil floats on the water and is hence easily collected.

HIGH PROFIT

The cost of cultivation, production of oil and the net profit from an acre of *E. citriodora* are given below.

Expenditure for the first five years	Rs.
Preparing land, digging pits and covering	300
Raising the nursery and preparing potted seedlings	50
Planting out seedlings and providing protection	50
Erecting a country still	500
After-cultivation expenses at Rs. 50, for five years	250
Total	1,150

Cost of production of oil	Rs.
Share of initial cultivation expenses towards cost of cultivation	50
After-cultivation expenses for the fifth year	50
Cutting leaves and distilling twice a year	1,000
Total	1,100

On an average at 1.5 per cent recovery, about 450 pounds of oil per acre per year will be obtained.

Cost of 450 pounds of oil at eight rupees per pound	Rs. 3,600
Net profit per acre	Rs. 2,500

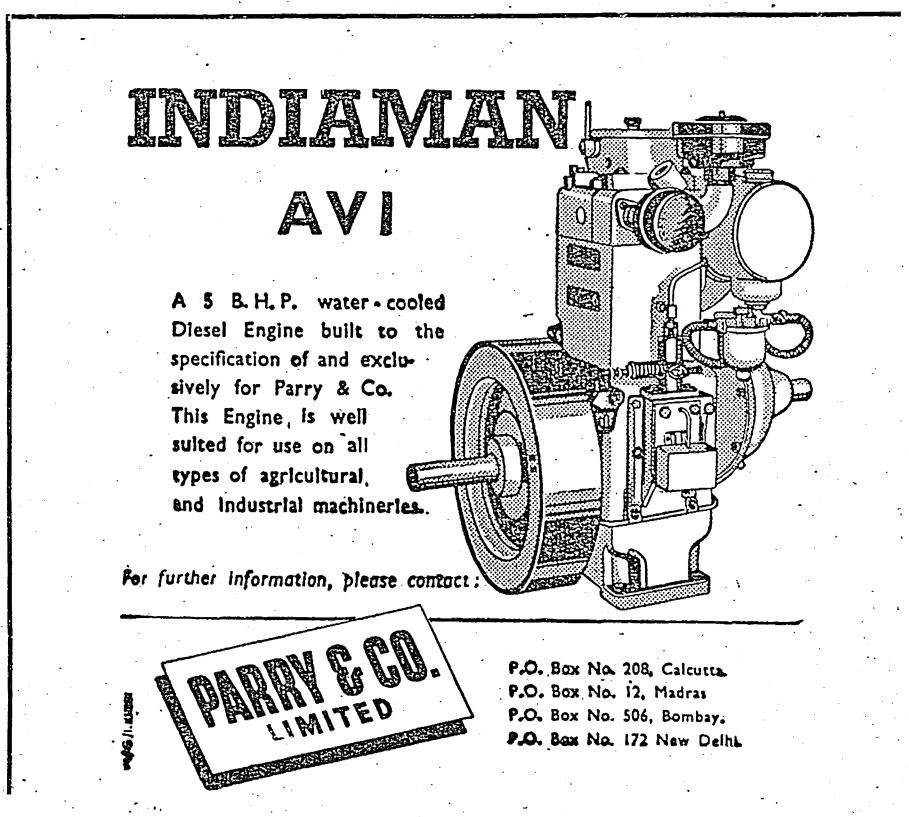
The cultivation and distillation of *Eucalyptus citriodora* is really profitable if we consider that very few crops can give such a high net profit as Rs. 2,500 per acre.

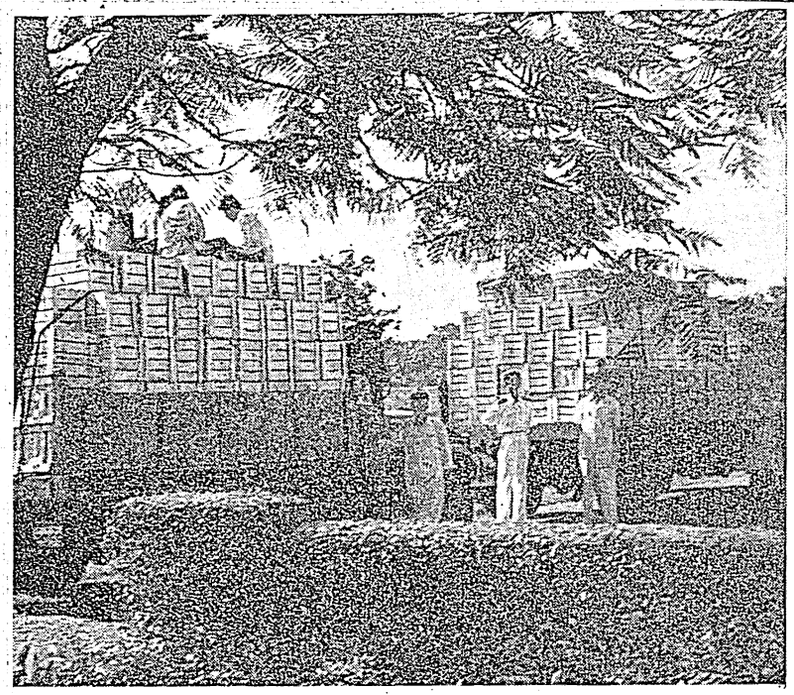
EASY AND EASIER

Most eucalyptuses thrive only on high elevations. Among those which come up in the plains, *E. citriodora* has proved to be the best. The species is also known as the lemon-scented gum. The oil it yields is pleasant, colourless and lemon-scented. The oil of *citriodora* is rich in citrionellal, ranging from 60 to 80 per cent, which is an important aldehyde in perfumery as well as medicinal industries. It is also a starting medium for the manufacture of menthol. At Ambalavayal, an oil recovery of 1.5 per cent was recorded by the water distillation method.

The oil of *citriodora* is not produced in India in large quantities. However, there is a great scope for building up the oil production on a commercial scale. A successful performance of the plant in Wynad has brought out its potentialities. It accommodates itself to poor soil conditions and does not need much of attention or care. It is easy to grow the plant and easier to distil the oil.

E. citriodora, therefore, deserves to be popularized on a large scale.





Crates of seed-potatoes on their way to the Plant Quarantine and Fumigation Station, Sewri, Bombay. There they will be inspected and treated before being released to the consignees

What Plant Protection is

by

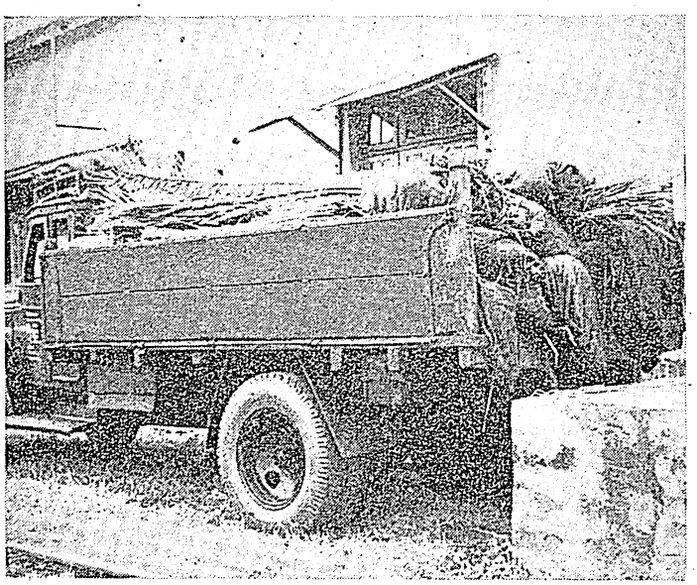
K.B. Lal

Plant Protection Adviser to the Government of India New Delhi

OVER 250 pests, about 150 diseases, 30 to 40 weeds and several parasitic flowering plants encroach upon agricultural crops in India and cause heavy economic losses. Many of the pests and diseases have been accidentally introduced into the country, e.g., woolly aphis of apple and late blight of potato, while many others are of indigenous origin, e.g., sugarcane borers and wheat rusts.

Plant protection aims at controlling these enemies of agricultural crops, orchards, plantations, ornamental plants and stored agricultural produce and thereby minimizing the losses caused by them.

And so is this consignment of date-palms



Plant protection also includes adoption of measures to prevent the entry of foreign pests and diseases into a country or area where they did not occur before, but where, if introduced, they may cause economic damage. This aspect of plant protection is termed 'plant quarantine,' which may be subdivided into 'foreign quarantine'—prevention of the introduction of pests and diseases into a country from external sources, and 'domestic quarantine'—prevention of the spread of pests and diseases from one area to another within the country itself.

Among pests are included not only insect pests, which are by far the largest in number and variety, but also such other animals as elephants, monkeys, jackals, wild boars, blue bulls, wild cattle, rats and other rodents, porcupines, flying foxes, some birds, tortoises, snails, slugs, crabs, earthworms, eelworms, spiders and mites. Sometimes, weeds and parasitic flowering plants are also referred to as pests.

Diseases are caused by fungi, bacteria and viruses as well as by deficiencies of some trace elements such as boron, zinc and manganese, in the soil. Improvement of deteriorated, sickly, weak or wilting condition of a plant or plant produce brought about by lack or excess of water or moisture, high or low temperature, shade or sun, injurious gases—whether from atmospheric contamination or given out by stored plant tissue, infertile or otherwise unsuitable soil and such other causes, is not a function of plant protection.

The term control implies the avoidance, suppression or destruction of pest or disease organisms to render

them harmless, and includes the correction of pest- or disease-producing conditions. Therefore, control may be preventive—aiming at conditions under which a pest or disease would not appear or assume serious proportions, or curative—involving the direct and mass removal or destruction of pest or disease organisms.

Complete eradication of a pest or disease from a crop or area for any long time is usually not easy to achieve, nor is it always essential so long as it is kept well in check.

CHANGING FUNCTION

A distinction has sometimes been drawn between pests and diseases which occur with expected, seasonal regularity, as, for example, paddy and sugarcane borers, mango hoppers, late blight of potato, red rot of sugarcane, and those which occur only during certain years, such as locusts, armyworms and wheat rusts. However, the occurrence of pests and diseases in destructive proportions depends on a variety of climatic and agricultural factors and the distinction is really not always sustainable.

Likewise, a pest or disease may be destructive in one area during any season but may not be so in another in the same season, and new pests and diseases may appear where they were not known before. Modern developments in agriculture involving reclamation of land, cultivation of new and improved crop varieties, use of new manures and fertilizers, increased facilities for irrigation and new cropping patterns, have led to severe and persistent incidences of pests and diseases.

MODE OF ATTACK

Elephants, wild cattle, jackals, monkeys and such other animals destroy plants or damage their parts, including fruits, to obtain food ; sometimes, they do so out of mischief also. Rats damage crops, stored produce, water channels and orchards and fields, and carry away wheat and barley earheads into their burrows. Parrots and other birds peck at ripening maize cobs and peas and growing fruits, and render them useless. Sparrows are notorious for picking up newly sown seeds before any germination can take place, and crows do the same to groundnuts. Porcupines dig up tubers of potato and other root crops. Tortoises feed upon young *singhara* fruits.

Locusts and grasshoppers, certain beetles, caterpillars and such other insects with biting or cutting mouth-parts, may partially or wholly defoliate plants and trees, thereby arresting their growth or even killing them. Many caterpillars, beetle grubs and fly maggots bore or otherwise enter into fruits, bolls (of cotton), shoots, stems and roots of plants and cause deterioration of fruits, arrest of plant growth, drying up of branches and death of plants.

The fruit-sucking group of moths pierce into unripe or ripening citrus fruits to suck juice from them, setting up rotting at the site of the punctures and causing premature fall of the fruits. Aphids, jassids, psyllids, mealy bugs and other scale insects, thrips and other insects with piercing, rasping or suctorial mouth-parts suck juice from fruits, flowers, leaves, twigs and even bigger branches of a plant or tree, resulting in their wilting, arrest of growth, discolouration and scorching of leaves and twigs, premature shedding of flowers, malformations of various kinds and death.

Many of the sucking insects transmit virus diseases, though some cases of insects with biting or cutting mouth-parts playing the same role mechanically are also known. The injury caused by the latter may serve also as a focus of infection for fungal and bacterial diseases. Sucking and rasping insects, eelworms and mites cause galls and other malformations on plants.

DISEASE DAMAGE

Disease infections result in the discolouration, distortion, necrosis, wilting or drying up or similar other unhealthy conditions of flowers, leaves, twigs, branches, stems or roots, and, in severe cases, death of the plant.

Stunting of plants and rotting of fruits are also caused by diseases. Potato tubers are reduced considerably in size and number on account of fungus and virus diseases. Disease organisms mostly damage the internal tissue and the nutritional system of the plant.

What otherwise would have been a nice cabbage crop is heavily damaged by caterpillars



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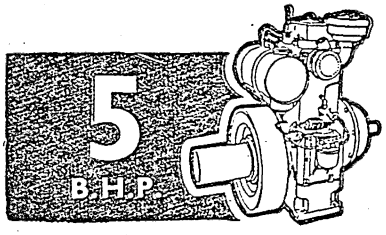
☆ FREE from INJURIOUS FREE FATTY ACIDS

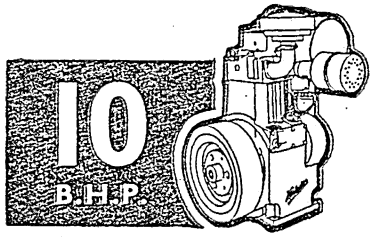
☆ HIGH WATER ABSORPTION

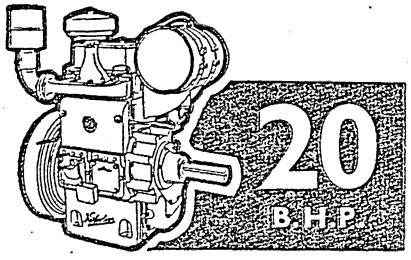
☆ SPECIALLY PREPARED at LOW TEMPERATURE to PRESERVE HIGH ORGANIC MATTER OF OIL SEEDS

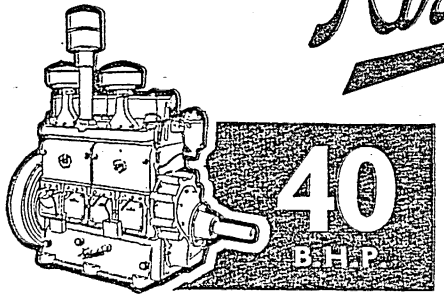
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Handfuls of locusts when the swarms entered Delhi State in 1954

WEED INJURY

Weeds become injurious by their mere presence, because they compete with cultivated plants for available moisture and nutrients in the soil and for space, air and sunshine above it. They may also serve, even though not growing within a crop or during the season of a crop, as sources of infection from pests and diseases by harbouring them, providing them facilities for growth and multiplication and carrying them over through periods when other host plants are not available.

Some weeds, like *kans* (*Saccharum spontaneum*), may get so well established in a field that cultivation may become impossible without first taking elaborate measures for their eradication. The water hyacinth may not only prevent the cultivation of paddy and *singhara* (*Trapa bispinosa*), but may also make it difficult to catch fish from the infested waters.

Some plants, such as *Cuscuta* and *striga*, establish themselves on the roots or stems of other plants from which they draw nourishment in part or full, being in organic union with them. The attacked plants are weakened, some may be distorted and deformed and some, especially crop plants such as sugarcane and *jowar* (*Andropogon sorghum*), may die.

MODE OF SPREAD

The movements and the consequent spread of mammals and birds and such other higher animal pests are determined by climate, availability of food and shelter, presence or absence of natural barriers and natural enemies, instinct for migration and even by chance circumstances.

Insects spread by the flights of their adults and the crawling of their larvae in which a continuity of suitable flora helps. Sometimes they may be carried away by wind or on the body of other animals. Eelworms may be carried about in seed, soil or water.

Insect pests and disease organisms may be dispersed through seeds, tubers, bulbs, stems, cuttings, flowers, fruits and other parts of a plant, as well as by soil, wind and water. Virus diseases are infectious and may be transmitted by mere physical contacts, through various vegetative propagating materials and methods, by certain insects acting as specialized vectors, through soil or by immature seed, or in more than one of these ways.

The major mode of dispersal of weeds is through their seeds which may be blown away by wind or carried about in water.

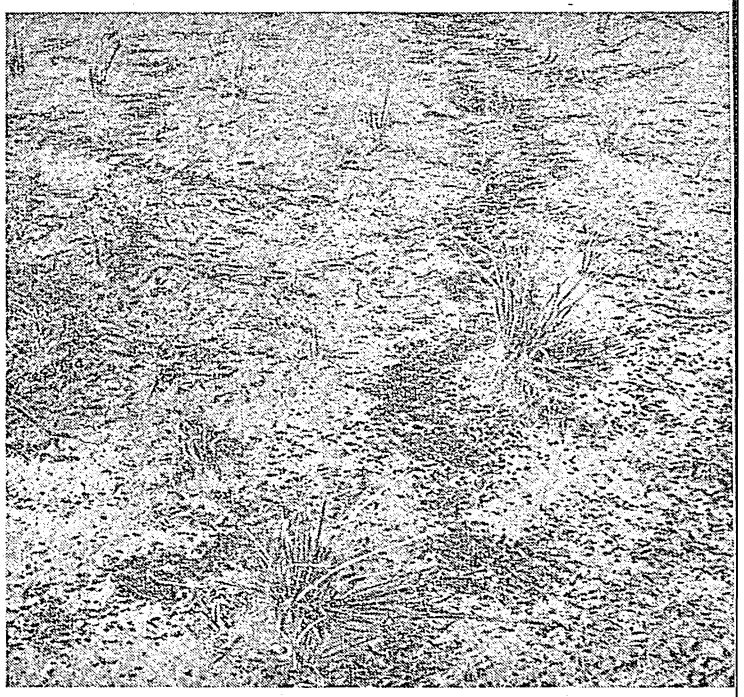
CONTROL MEASURES

Measures for controlling pests and diseases must be effective, practicable, harmless and economical.

To be effective, a measure must successfully prevent the appearance of a pest or disease, or achieve a high degree of destruction of a pest or disease organism. The process of destruction should be reasonably quick and, it is not only desirable but in some cases essential that it should be prolonged over a period as a result of one application of the measure. Some synthetic chemical insecticides continue to be toxic to insects for

(Contd. on page 32)

Their concentration was very heavy



Israel Lives the Co-operative Way

by

O. P. Dahama
Agricultural College
Gwalior

CO-OPERATION is very conspicuous in the agricultural life of Israel. There are local co-operatives, district co-operatives and country-wide co-operatives. In fact, there is no field of economic activity in Israel where co-operation has not reached.

Israel has a total population of about 18 lakhs, mostly Jews. It is not very rich in agricultural resources. Two-thirds of its 80,000-square mile area is almost a desert, receiving less than eight inches of annual rainfall. It has very few, and those too small, rivers.

About 70 per cent of the agricultural production comes from co-operative settlements or villages affiliated to the country's labour organization (*Histadrut* in Hebrew). In citriculture, 30 per cent of the production is co-operatively organized ; co-operative marketing of citrus fruits is on a much larger scale.

LABOUR ORGANIZATION

About 90 per cent of the workers in agriculture, industry, building industry and clerical and liberal professions are members of the General Federation of Jewish Labour. Its basic principles are non-exploitation, self-help and mutual aid.

Its membership is open to any man or woman, regardless of race or religion, and each member has to pay about four per cent of his monthly income to the organization. The amount thus collected is distributed over workers' sick fund, organization, social welfare, invalidity fund, widows' and orphans' fund and work fund.

The activities of the organization can be divided into four groups : trade union activities similar to those in other countries, mutual aid like workers' sick fund and other security funds, economic activities, and cultural activities, education and absorption of new immigrants.

For co-operatives, the organization has a branch called General Co-operatives Association of Jewish Workers (*Hevrat-Ovdim* in Hebrew). It is divided into branches like : Agricultural Settlements, Agricultural Marketing, Consumers' Co-operation, Finance and Insurance, Transport, Building and Public Works and Housing industry.

AGRICULTURAL SETTLEMENTS

In Israel, land belongs to the Jewish Agency, a private organization of all the Jews, and is given on lease for 49 years to an individual farmer or a collective village or an institution. The Jewish National Fund receives contributions from Jews the world over, and is utilized for purposes such as land reclamation, development of irrigation, plantations and afforestation, and settlement of immigrants, youths from old settlements, agricultural schools and urban areas.

Israel has a variety of settlements. It has co-operative villages including *Moshavim-Ovdim*, immigrants' *Moshavim* and middle class settlements, collective settlements (*Kibbutzim*) semi-collective villages or collective small holders' settlements (*Moshavim-Shitufim*) and private agricultural villages.

CO-OPERATIVE VILLAGES

These are founded on principles of mutual aid and equality of opportunity, all farms being equal in size. Hired labour is prohibited. Each settler farms his land independently on his own responsibility. Economic existence and social security are ensured by a co-operative structure which touches upon almost every aspect of the farmer's life.

Unlike the more usual line co-operatives of other countries, a unified village co-operative covers all the functions to which co-operation can be applied. It markets all the farm produce, handles farm and household purchases and acts as a credit agency ; it also provides many other services such as insurance, water supply and various municipal amenities.

Frequently, it even enters certain fields of production. These may range from a machine-tractor station to co-operative hatcheries, co-operative grain production and collectively financed orchards.

Collective settlements. These are free associations of people intending to found and to live in an agricultural collective settlement. Here, all property is jointly owned. Every member acts as part of the community and on its behalf.

The wife and the husband are treated as separate members. The members give their labour to the common stock and receive from the settlement the satisfaction of their needs in accordance with the principles and financial means of the settlement. It is organized into various committees like work committee, cultural committee, farm committee, educational committee, health committee, security committee and relatives' aid committee.

With its development, the settlement strives to encompass an ever-widening range of requirements and raise the supply of basic needs to a higher level. The three main principles—voluntary action, democratic structure and material responsibility, govern the life of the society in a *Kibbutz*.

Collective small-holders' settlements. These are a compromise between the individual co-operative villages and collective settlements. Here, the production is collective but consumption individual. The land, the means of production, the buildings and agricultural or industrial products are the property of the settlement as a whole. Work is done collectively, which is assigned to the members by a labour committee.

The settlement provides every member with all the necessities of existence like housing, food and clothing (for which a monthly allowance according to the size of the family is given) ; it takes care of the education of his children, his medical needs and needs like a daily newspaper, cultural activities, etc.

Unlike the *Kibbutz*, each member lives in his own house with his family. Although the house legally belongs to the collective, it is the permanent home of the settler, and the furniture and other household goods are his personal property.

In addition to running the household, the housewife has to work for some hours daily in the vegetable garden, orchard, dairy, bakery, book-keeping section or the store, or help take care of young children in the kindergarten, nursery school, etc.

Private agricultural villages. These are just like Indian villages and are mostly inhabited by Arabs or Drutz.

AUDIT UNIONS

The audit unions lay down uniform systems of accounting, conforming to the needs of the different types of affiliated societies. They organize regional conferences and courses in accountancy. They act as official auditors of the co-operatives, and collect and compare data of different settlements to disclose shortcomings and their causes and to publish statistics covering most of the problems regarding agriculture. Unlike India and other countries, the Co-operative Department of the Government is not required to maintain Departmental Auditors.

CO-OPERATIVE MARKETING

There are National Co-operative Marketing Organizations, e.g., for sale of agricultural commodities there is one organization called "TNUVA" which handles about 80 per cent of the agricultural products of the farmers. Similarly, there is one big co-operative supply organization known as "Hamashbir Ltd." It supplies farmers with feeding stuffs, seeds, machinery spare parts as also long-lasting equipment including machinery. It also furnishes many consumer's goods to settlements as also to affiliated consumers' co-operatives in cities, small towns and open villages.

Citrus Control and Marketing Board. Israel produces about nine maunds of citrus fruits per capita of population. The average annual export amounts to eight million cases (a case weighing 35 seers). This Board operates, through a number of contractors, mostly citrus-growing co-operatives, which are concerned with fruit packing. It has eliminated cut-throat competition, reduced marketing costs and has made it possible to obtain the most favourable conditions of shipping.

ARTIFICIAL INSEMINATION CENTRES FOR CATTLE

The whole country is divided into three regions for this purpose. Each region has a centre where a suitable number of good bulls, laboratories for testing the semen and a number of inseminators with other staff and equipment are maintained. A farmer who keeps a cow has to become its member by paying ten pounds per year (one Israeli pound=Rs. 2.75).

The inseminators visit the villages in their jurisdiction daily and inseminate the cows reported in heat. This type of breeding has enabled the farmer to achieve 6,500 seers of milk per milch animal per lactation. There are some settlements where the average milk yield per lactation per cow is over 8,000 seers.

TECHNICAL DEVELOPMENT ASSOCIATIONS

Associations on a nation-wide basis like the Vegetable Growers' Association, Poultry Breeders' Association, Cattle Breeders' Association, associations for cereals, plantations, sheep-raising, bee-keeping, fish-breeding, etc., help the farmers in different branches as regards technical advice, fighting of pests and diseases and use of equipment like sprayers.

COUNCIL OF PRIVATE AGRICULTURE

This is an organization of farmers living in private agricultural villages. Members get help in their agriculture, sale, purchase, etc., through this organization.

FARMERS' FEDERATION OF ISRAEL

The farmers who are not members of *Histadrut* are members of this organization. On the parallel lines of *Histadrut*, this Federation has six departments, namely, Settlement Department, Professional Department, Organization Department, Labour Department, Tax Department and Economics Department.

why not have a woodlot on your farm?

by
A. Ramakrishna
District Forest Officer, Guntur

FEW in our country understand and appreciate the potentialities of forests and the significant role they play in agricultural welfare and general economy of the country. To the great majority of our people, forests mean merely the abode of wild animals that kill men and destroy agricultural crops ; to some, the shikaries, they may mean mere pleasure resorts.

Very few realize that forests are the protectors of agricultural soil and the guardians of the water supply. Agriculture is the foundation of any civilization, and flourishing civilizations are known to have disappeared under sand and silt as the forests were thoughtlessly removed to make room for agriculture.

The forests on the hills, that form the watershed for the drainage of the country, act like a sponge and ensure a steady supply of water to the fields below throughout the year through springs, streams, wells, etc., thereby helping maintain the tempo of agricultural production at a high level. Bereft of the forest cover, the rain water rushes down the hills in torrents and floods, washing off the fertile topsoil and even whole crops in its train—causing incalculable damage to the rural economy and a serious setback to the country's prosperity. Once the rains cease, the water-table falls rapidly and drought sets in, accompanied by desiccation and wind erosion with all their harmful effects.

The forests on the plains, besides protecting the soil, meet the varied needs of the farmer such as timber for his agricultural implements and house construction, bamboo for baskets and pasture for his cattle.

VAST MANPOWER

In advanced countries like America, where agriculture has been mechanized considerably, the manual labour requirement has been reduced to one-fourth of what it was hitherto. The other three-fourths thrown out of agricultural employment are now running the industries, buses, trains and a thousand and one other things necessary for the complex needs of modern life.

All this manpower, on whom the industries of the country depend, has to be maintained by both the farmer and the forester. The relationship amongst farmers, forests and industries is better illustrated by the following figures: for every million automobiles produced, the farm products required are (*i*) wool from 8,00,000 sheep, (*ii*) by-products from 30,000 cattle, 20,000 hogs and 1,00,000 goats, (*iii*) products of 4,33,000 acres of cotton, of more than 11,000 acres of corn, of 17,000 acres of flax, of about 1,25,000 acres of sugarcane and (*iv*) 50,000 acres of timber.

The advanced countries of the world have been able to raise the living standards of their peoples by rapid industrialization, increasing their earning capacity and bringing the minimum necessities of life within easy reach of everyone. Since industry ultimately depends on the farm and the farm in its turn depends on the forest for its sustenance, it is needless to emphasize that for the agricultural and industrial prosperity of a country forests must be maintained at a high level of productivity.

The forests on the catchment areas, and those that yield timber, fuel and other requirements of the urban population and various industries, are managed by the state in the larger interests of the nation ; but it is also essential that the farmer, whose lands lie in the plains, takes an active and abiding interest in forestry and integrates it into his agriculture, treating it as much a part of his farm as his seed and manure. It is high time the farmer developed a 'farm forestry' outlook.

No doubt, it is difficult to reorientate and broaden the outlook of the farmer from the above perspective, because the forest crop is a long-term crop taking anything from ten to 75 years to mature, whereas the agricultural crop becomes ripe for harvest in a matter of months. But it is up to us to show him the benefits he would derive from farm forestry.

The growing of a woodcrop does not require fertilizers, nor does it require cultivation of the soil. It requires a comparatively small amount of labour. In India, where agriculture is the biggest industry, employing nearly 80 per cent of the population, the state forests alone cannot adequately meet the essential needs of the farmer such as pasture for his cattle and manure leaf.

Not only are grazing and removal of leaf-litter incompatible with soil conservation, but removal of leaf particularly also impoverishes the forest soil progressively, thereby lowering its productivity. So it is imperative that the farmer is induced to grow a forest crop by persuasion, or by legislation if persuasion has no effect.

What then are the values and benefits that the farmer can realize by practising forestry as part of his farm activities ?

Firstly, woodland on the farm would enhance its aesthetic value which will definitely weigh with some while assessing the value of the farm.

Secondly, a farm woodland, be it in the form of a wind-break, a shelter-belt or a more extensive woodland, is the strongest bulwark against soil erosion. By thus preserving the soil, it protects the adjacent cultivated or pasture lands.

When the forest cover is removed, the rain water runs off without any check and not only washes off the precious few inches of topsoil and cuts deep gullies, but also deposits the debris on cultivated lands lower down, causing much material loss. In northern Mississippi in the U.S.A., research has shown that the loss of soil from a forest-covered land during a storm period, resulting in 24 inches of rainfall, was 75 pounds per acre, whereas it was 34 tons per acre from cultivated fields.

Thirdly, a farm woodland in the form of a wind-break can protect the soil from wind erosion, for, wind can do as much damage to unwooded land as rain water by blowing off the valuable topsoil. The progressive fall in the yields of our agricultural crops year after year in the dry areas, is not a little due to this wind erosion besides other causes.

Extensive stretches of treeless arable lands, exposed to the fury of the winds and severe desiccation during the dry weather, are not an uncommon sight in our country; wind-breaks and shelter-belts will certainly go a long way in preserving their agricultural potentialities and ensuring steady, if not increased, yields.

A belt of trees planted at right angles to prevailing winds, would break the force of the wind and afford protection to the soil for distances equal to 20 times the height of the trees on the leeward side and three to five times their height on the windward side. A belt of five to ten rows of trees 30 feet high would give protection to a horizontal distance of 600 feet.

The slowing down of the wind starts a whole chain of favourable local climatic influences such as reduction of evaporation, moderation of temperature and increase in the relative humidity of the air, all of which are conducive to increased crop-yields.

The ability of the wind to move and pick up soil varies at least as the square of its velocity. A 20-mile-an-hour wind has four times the capacity to pick up soil as a ten-mile-an-hour wind. Therefore, even a ten per cent reduction in wind velocity would mean a great deal. An increase of 40 per cent in the yield has been recorded from fields protected by trees in the Great Plains of America, as compared with unprotected ones.

A woodland on the farm can meet the immediate requirement of small timber, fuel, manure, etc., of the farmer. Our country is short of the optimum $33\frac{1}{3}$ per cent of forest area by about 1.4 lakh square miles of forests. As a result, the existing forests are unable to meet fully the timber, fuel and other requirements of the population. The farmer perforce burns the valuable cow-dung. A farm woodland will not only make up the shortage of forests in the country and bring the essential forest products within easy reach of the farmer, but also save the precious cow-dung for use as manure.

PROTECTIVE FUNCTION

The pasture in the woods has a protective function in addition to its utilitarian value. Experiments have shown that soil losses were nearly a 100 times and water losses 60 times as great from grazed as from ungrazed woodland. The difference was both due to the loss of the forest litter and the compaction of soil caused by grazing animals. If pasturage can be provided on the farm itself, the pressure of grazing on the state forests could be reduced.

Pastures can be cultivated with pedigree fodder grasses, and more cattle fed in the stalls with cut grass than direct grazing would permit. Direct grazing by depleting the stock of superior strains and compacting the soil would do positive harm to the pasture, unless controlled. Measures to control grazing are not only costly but also so cumbersome that an uneducated farmer, who is the rule in our country, will find them puzzling.

A farm woodland can serve as a biological control over possible insect pests through birds and other predatory animals whose regular diet is partially or wholly made of insects. The other animals may yield some revenue through their skins and horns.

A farm woodland provides recreation for the mentally tired farmer.

The farm woodland thus has all the attributes and advantages of the forest, its utility depending on its extent and the care it receives.

Farm forestry not only confers multifarious benefits on the farmer, but also serves to fill the wide gap that exists in a country between the actual and the optimum forest area. The farmer who dedicates a part of his farm to growing of woodland renders a great and signal service to the nation at large while also benefiting himself.

Having recognized that farm forestry is in the national interests, how shall it be brought about ?

FIRST AND FOREMOST

The problem should not be approached from the forestry viewpoint, as then it will fail to capture the imagination of the farmer and enlist his goodwill and co-operation. On the contrary, it should be sized as a problem of the farm itself and broached to the farmer as a personal problem first and foremost. The following two measures are indicated for achieving success.

Not only the actual farmer but even the agricultural officers who tender technical advice on agriculture should be appraised of the direct and indirect benefits that accrue to the farmer and his agriculture by raising woodland as part of the farm.

If the farmers could see for themselves a successfully managed farm forest and its good effects, nothing else would carry home the message of farm forestry as forcibly. The demonstration project will naturally take a fairly long period to achieve results, but that should not deter us from taking the right step. The demonstration project should be the joint venture of the Forest and Agriculture Departments. Where the individual holdings are too small to accommodate woodlands, the positive results of the demonstration project would, it is hoped, induce farmers to pool their resources for their collective benefit.

CHOICE OF TREES

The choice of species that will be useful to the farmer will depend upon their functions and the local factors. For wind-breaks and shelter-belts, quick-growing species such as *Prosopis juliflora*, *Cassia siamea* and *Gliricidia montana* will be effective ; if these are sown mixed, their products may also be useful, e.g., the leaf of *Cassia siamea* and G. *montana* as manure and pods of *P. juliflora* as cattle fodder.

For small timber, *Akbizzia lebbeck*, *Dalbergia sissoo*, *Acacia arabica*, etc., may be grown ; their lop and top can be used as fuel. For leaf fodder, the following species are recommended : *Helicteres isora*, *Ficus religiosa*, *Acacia catechu*, *Zizyphus jujuba*, *Acacia arabica*, *Aegle marmelos*, *Eugenia dalberiodes*, *Morus indica*, *Zizyphus nammularia*, *Millettia auriculata*, *Bauhinia variegata*, *Quercus incana*, *Kydia calycina* and *Dendrocalamus strictus*.

Forestry or agriculture, the problem resolves itself to one of making the best use of land in proper proportion. It would be unfair to the plainsmen for the hillmen to clear the forests on the hills to make room for cultivation ; it would be eqully unfair for the agriculturist to clear the forests on the plains for the reason that the land is more suited to cultivation ; that would deprive the

other sections of the population of the source of timber, fuel, grazing and other requirements.

In our country, in the early days of land settlement, it was laid down as a salutory principle that communal grazing grounds equal to 1/3 of the area under cultivation should be left around each village, and that cultivation should not be allowed too close to the forest (reserve forest). These principles were relaxed during the last war, and thereafter in the name of the ' grow more food ' campaign. Consequently, cultivation has been extended at the expense of the village communal grazing grounds, and there is a persistent demand for throwing open the reserve forest also either for cultivation or for grazing.

The cultivated lands comprise 40 per cent of the land, and it can be safely asserted that cultivation has reached its limits. The forest area is only about 22 per cent as against the optimum of $33\frac{1}{3}$ per cent. As the contribution of forests to agricultural production is considerable, it is not enough if the existing forests are preserved ; every endeavour should be made to attain the optimum area by growing forests in as many directions as possible—on farms, along roadways, canal banks, railway embankments, etc.

The growing population of India requires an additional million tons of foodgrains every year. The solution to this problem of increasing agricultural output lies not in extensive but in intensive cultivation, observation of principles of soil conservation and soil fertilization and a judicious integration of forestry and agricultural practices.

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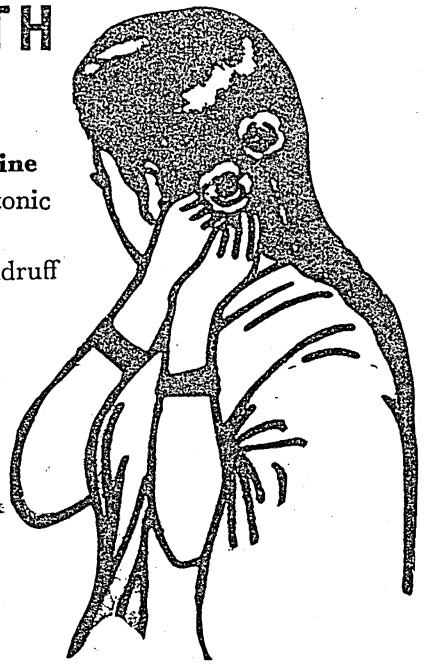
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PLANT PROTECTION

(*Contd. from page 27*)

several days after they have been sprayed or dusted over a crop.

Practicability means that a control measure must be such as can be easily practised on a large scale under conditions normally prevailing anywhere.

Harmlessness implies that a measure, even though effective and practicable, must not injure crops or be unsafe to domestic animals and human operators; it must not also leave injurious residues in the crop produce or in the soil.

A measure is required to be economical only in a relative way, and the expenditure on it must be justified only by the gain to be achieved. There is, therefore, no such thing as a cheap or costly measure in plant protection. Although, theoretically, an expenditure may be justified if it results in the slightest margin of gain, it is expected in normal plant protection practice that this gain must be at least five to ten times the expenditure incurred.

It is a common error to calculate expenditure on a plant protection measure without including the cost on labour if the labour has been provided by the farmer himself free of any charge. The farmer who adopts a measure himself must include his wages in an assessment of the cost of the measure. Only if a measure is shown to be effective, practicable, harmless and economical must it be considered suitable or satisfactory.

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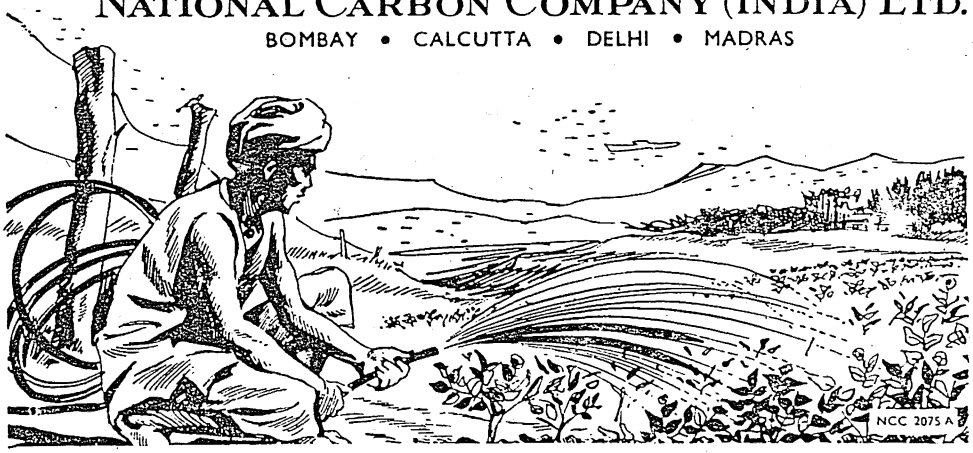
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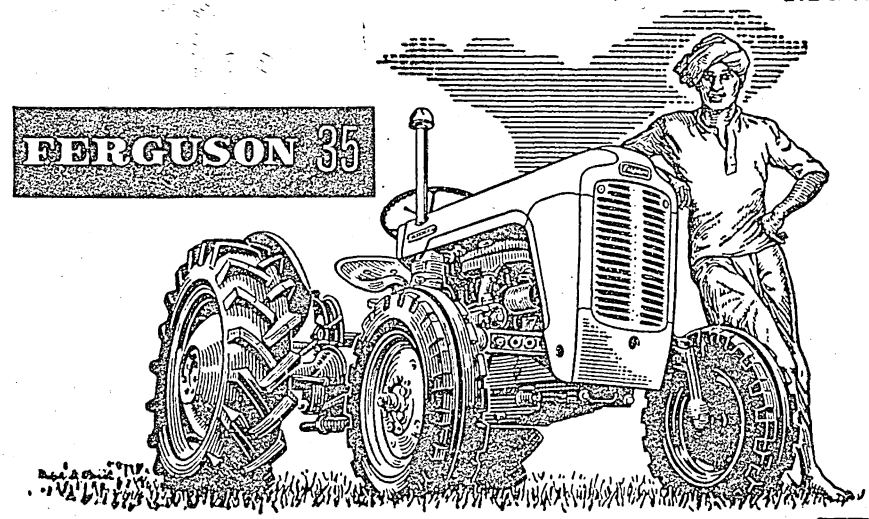
My basic job is to assist in raising this country's food production from its present low level—so low that we have to buy abroad.

The extent to which I can help is very often not realised—it certainly is not realised enough.

Whether it is wheat or rice—gram or grass—sugar or groundnuts—whatever it is, only I can reliably and economically:

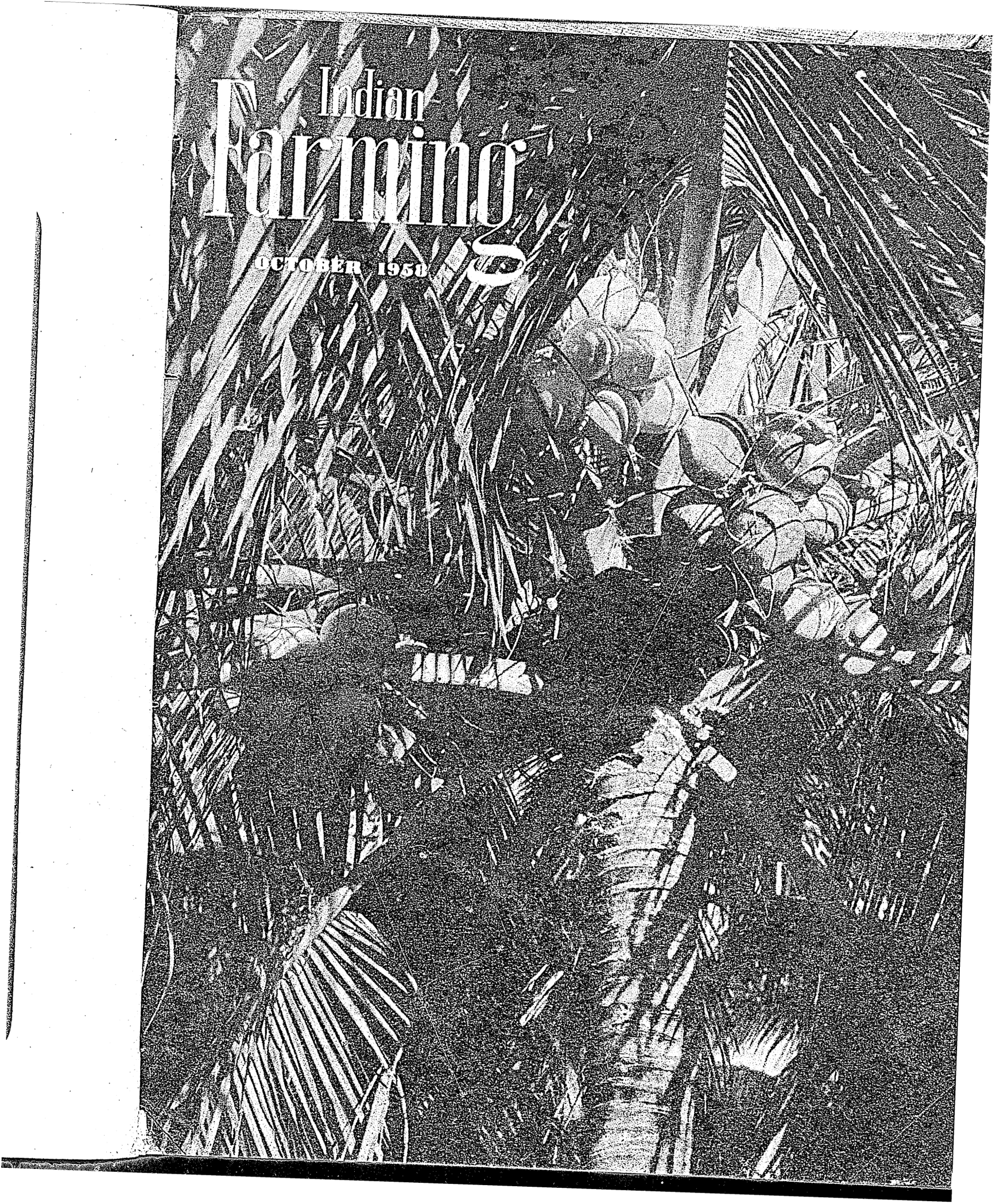
- Have the soil ready for the rains or water,
- Prepare the best tilth to suit the crop,
- Sow quickly and well on the right day,
- Give the crop attention whilst it grows,
- Harvest at the right time,
- Do, in time, all those never-ending duties such as agricultural haulage, soil conservation, water distribution and so on—which mean the difference between shortage and enough.

MECHANISATION MEANS MORE MEALS



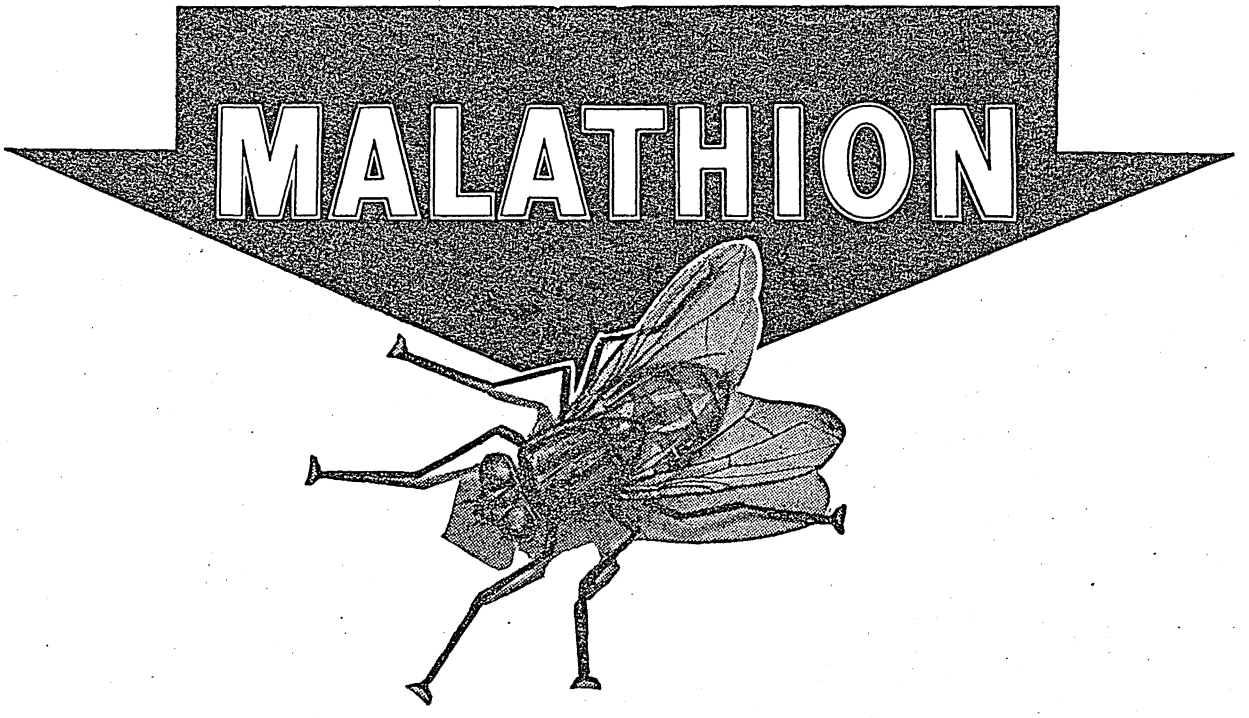
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Indian
Farming
OCTOBER 1958

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AGRICULTURAL DIVISION

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OCTOBER 1958

Vol. VIII No. 7

OUR COVER



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Indian Farming

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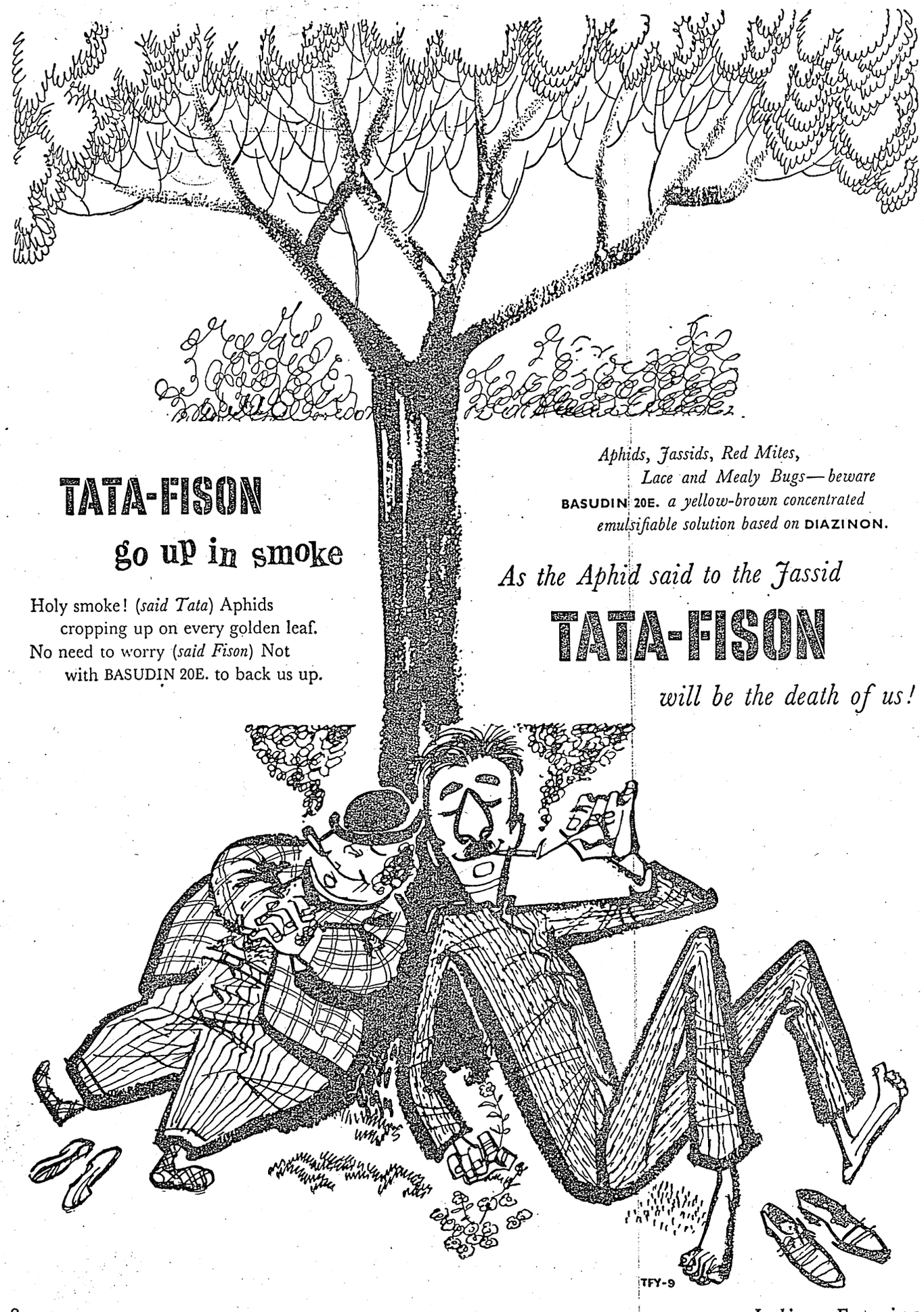
Editor : **Harkirat Singh**

ISSUED BY

THE INDIAN COUNCIL OF AGRICULTURAL RESEARCH

NEW DELHI

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TATA-FISON
go up in smoke
Holy smoke! (said Tata) Aphids
cropping up on every golden leaf.
No need to worry (said Fison) Not
with BASUDIN 20E. to back us up.
Aphids, Jassids, Red Mites,
Lace and Mealy Bugs— beware
BASUDIN 20E. a yellow-brown concentrated
emulsifiable solution based on DIAZINON.
As the Aphid said to the Jassid
TATA-FISON
will be the death of us!
TFY-9

editor's page

27 OCT 1958

FEEDING THE NATION

THE Indian farmer has been assigned a great task—that of feeding the entire nation by increasing the production of foodgrains this *rabi*. This is a responsibility he can very well be proud of. The realization of the fact that his country has reposed complete faith in him for its food needs should spur him on to greater activity.

AND, he won't be alone in this task. The government will stand by him fully prepared to provide him with the maximum facilities for a more intensive cultivation.

THE main crops that he will be required to concentrate upon are wheat, barley, *rabi jowar* and gram. The steps that will require his special attention are preparation of land, selection of seed, method of sowing, fertilization and after-care.

REPRESENTATIVES of agricultural departments taking part in the *rabi* production drive launched by the Union Government will be right at the farmer's door to advise him on how to boost his yields. They have been instructed to help him out of any difficulties that may stand in his way in achieving this objective.

IN FACT, by now they must have already been to the villages once or twice. The farmer should not hesitate to place his problems before them, be they regarding supply of improved seed or fertilizer, or control of crop pests and diseases.

WHATEVER the government aid and whatever the form it is offered in, ultimately it is the farmer who has to give practical shape to the latest in agricultural techniques that may be passed on to him or utilize properly any materials or implements that may be recommended for his use.

ON HOW spiritedly he sets about the task will depend the ultimate success. His wholehearted co-operation is the need of the hour. He must rise to the occasion.

NEW BOOKS RECEIVED

Control of diseases in Cattle and Sheep at Pasture

Price 9 s. or $ 1.50

Farm Management—Manual on the Preparation of National and Regional Handbooks for Use in Farm Management Advisory Work

Price 10s. 6d. or $ 2.00

Marketing and Distribution of Meat and Dairy Products in the United States

Price 6s. 6d.

Published by the European Productivity Agency of the Organization for European Economic Co-operation, Paris

⁂

Literature Review on Oils and Fats, 1956

Investigations on the Composition and Nutritive Value of Vanaspati, vol. 2

Published by the Council of Scientific and Industrial Research, New Delhi.

⁂

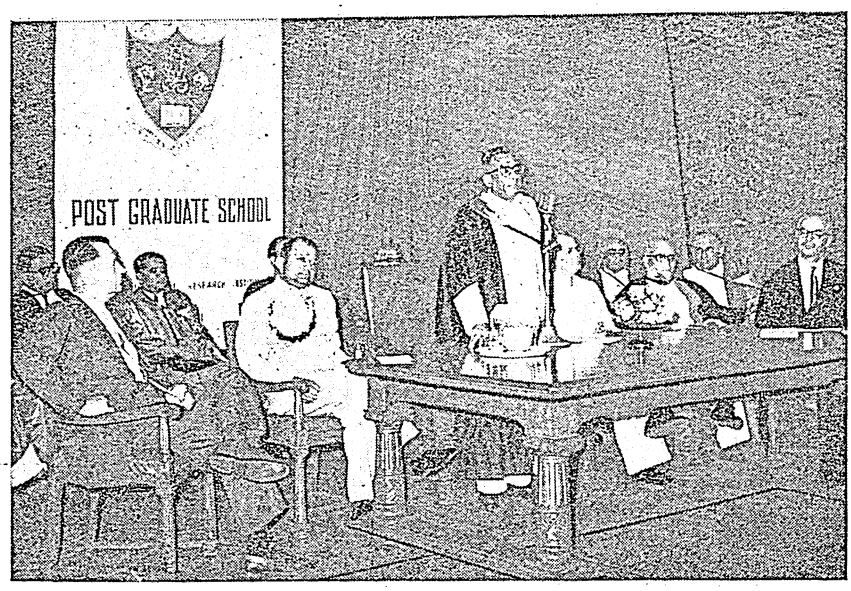
Statistical Statements Relating to the Co-operative Movement in India, 1956-57

Published by the Agricultural Credit Department, Reserve Bank of India, Bombay; price Rs. 2

⁂

Annual Report, 1957, of the East African Agriculture and Forestry Research Organization—Record of Research for the period 1st July, 1956 to 31st December, 1957

Printed by the Government Printer, Nairobi; price sh. 3/50



Shri Ajit Prasad Jain, Union Minister of Food and Agriculture, inaugurating the Post-graduate School of the Indian Agricultural Research Institute in New Delhi on 6th October, 1958

The Pusa Institute Covers Yet Another Milestone

ON the sixth of this month, the Indian Agricultural Research Institute at New Delhi entered a new phase of its life when its status was raised to that of a full-fledged Agricultural University with the opening of a school for post-graduate studies in agriculture. The school will prepare students for the award of M.Sc. and Ph. D. degrees in the various branches of the Agricultural Science, in collaboration with the Rockefeller Foundation.

Established in 1905 at Pusa in Bihar, the Institute was shifted to its present site in New Delhi after the great Bihar earthquake of 1934. Facilities for regular training in methods of agricultural research at the Institute were, however, provided for the first time in 1924, on the recommendation of the Royal Commission on Superior Services, though no regular syllabus for studies was fixed or examination held on completion of training.

By 1937, the Institute began conferring the Associateship Diploma on students who, after the successful completion of their practical training, submitted theses written on the basis of original work in any branch of the Agricultural Science. In 1944, the Institute also undertook to train Extension staffs for the Departments of Agriculture of the then provinces, on the recommendation of the Policy Committee on Agriculture, Forestry and Fisheries. With the augmentation of the teaching staff in 1945, eighteen subjects were available for specialization at the Institute. Regular syllabuses of studies were laid down and regular courses of instruction consisting of classroom lectures and field and laboratory work were introduced. The completion of courses was followed by regular examinations of students with which senior external examiners of University or Government Institutes were associated. The teaching facilities at the Institute expanded still further after the Independence when its staff was strengthened with necessary technical personnel in almost all branches of agriculture.

WELL EQUIPPED

Under the First and Second Five Year Plans, the Institute has been provided with the necessary facilities for research and training by way of equipment, laboratories and scientific personnel so that today it is one of the best of its kind in the world.

The Institute comprises a Directorate and seven Divisions, complete with buildings and installations such as workshops, glasshouses and experimental fields. The farm area attached to the Division of Agronomy consists of 350 acres of irrigated and 15 acres of rain-fed land, the latter being developed for dry farming research ; the Botany Division has 50 acres of the irrigated land at its disposal for its experiments and the Horticulture Division, 30 acres. The Central Library of the Institute is one of the biggest of its kind in Asia and houses over one hundred and forty thousand volumes on various agricultural subjects. More than a thousand journals and periodicals dealing with agriculture are received in the library from all parts of the world.

MANY CONTRIBUTIONS

Many and varied are the contributions that the Pusa Institute, as it is popularly known, has made to the progress of agricultural research in the country during the fifty and odd years of its existence.

The Division of Agronomy has bred and maintains a Sahiwal herd of milch cows, which is one of the best in India and is known the world over for its most consistent performance. Besides cattle improvement, the Division has contributed towards increased production of fodder by introducing berseem—the high-yielding nutritious green fodder from Egypt. Cultural experiments with sugarcane have indicated that cultivation deeper than five inches does not benefit the crop.

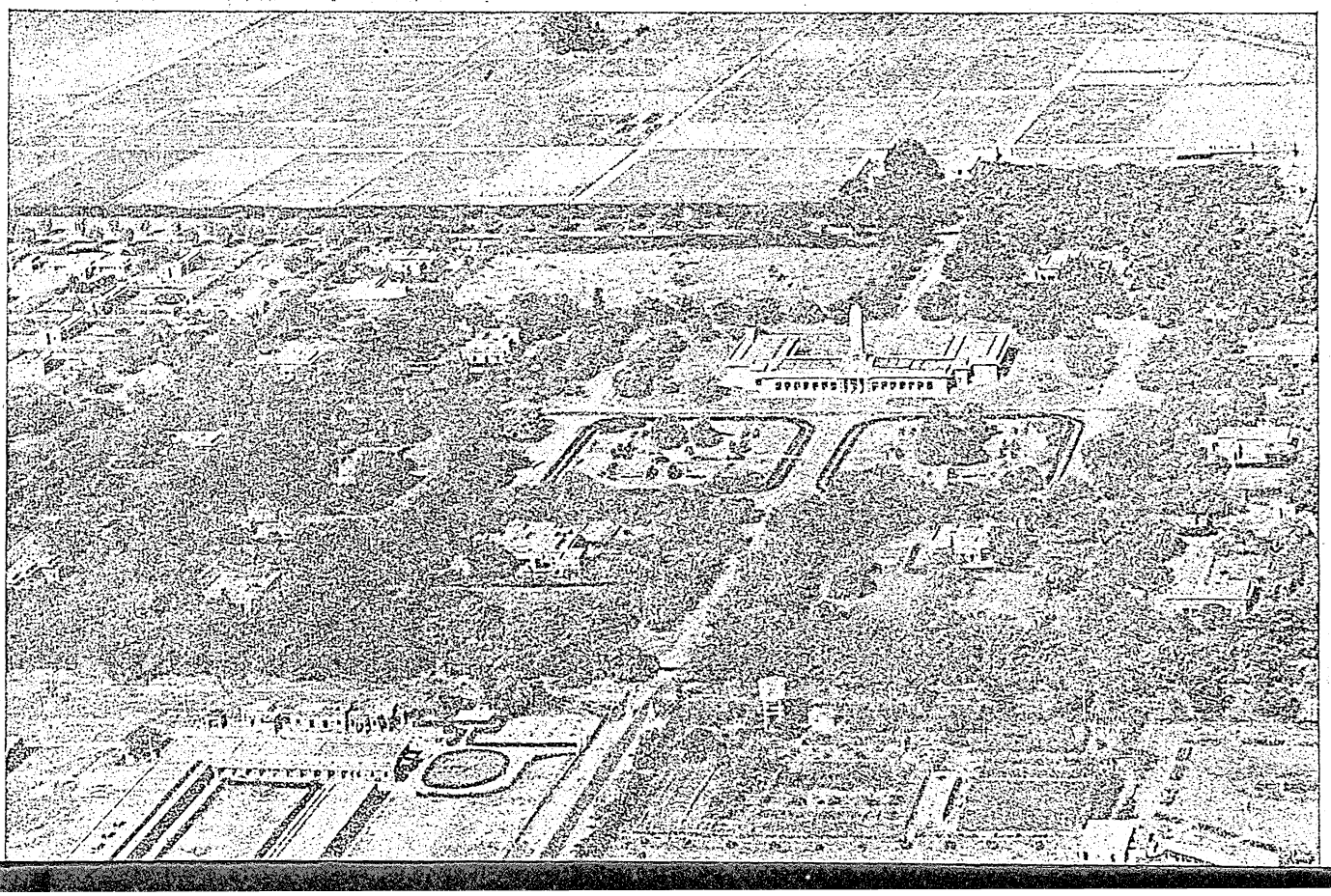
LIVING COLLECTION

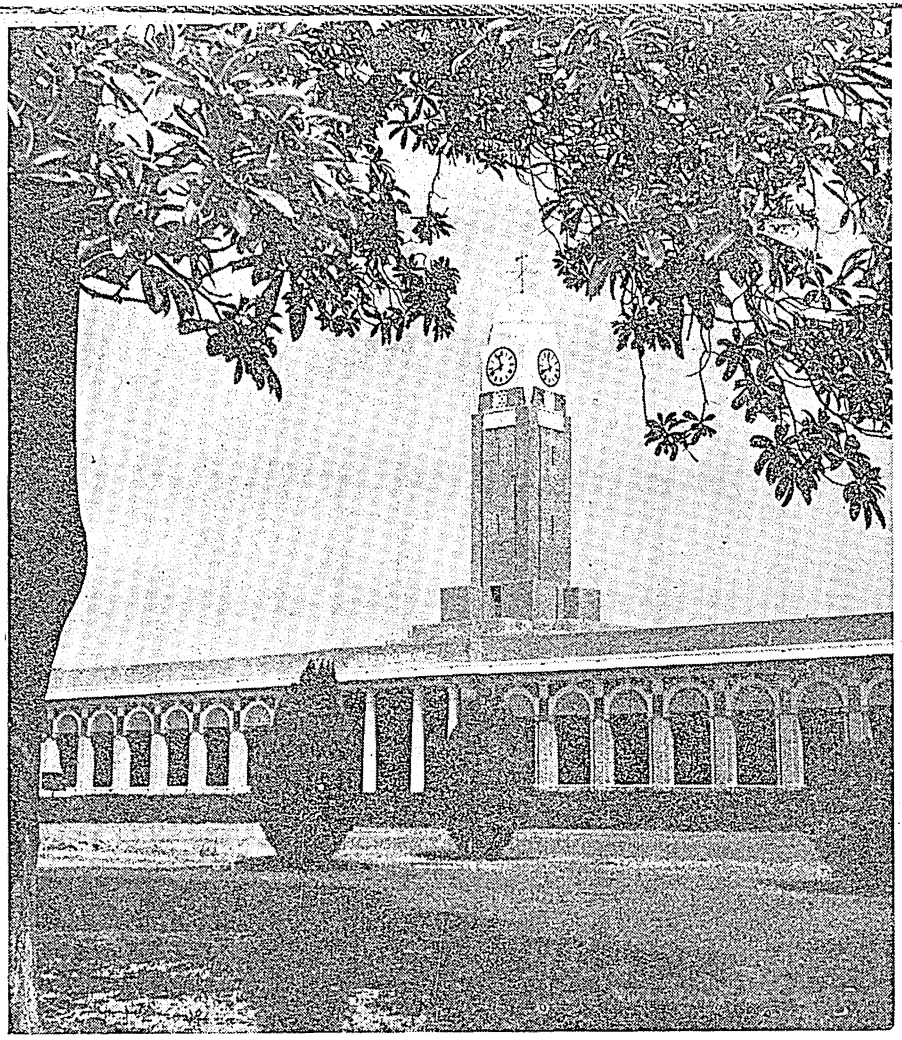
At the Division of Botany, a large living collection of indigenous and exotic crop plant varieties and their related species is being maintained. The most outstanding contribution of this Division is the evolution by breeding, in a large number of crops and plants, of improved strains combining high yield, good quality of grain, fibre or oil, and insect pest- and disease-resistance. The Pusa wheats bred in this Division are world famous. One recent instance is the production of a sweet-flavoured tomato of high vitamin content from a cross between the ordinary cultivated tomato and a wild species from South America.

The Division of Horticulture which has been established recently has taken up important work on fruit and vegetable improvement.

In the Entomology Division is located the large and valuable National Pusa Collection of insects built up during more than four decades of survey and collection from all over India and by mutual exchange with other countries. The technique of breeding of seven parasites of economic importance has been developed and standardized in this Division.

This is how the Pusa Institute looks from the air





One of the biggest of its kind in Asia is the Pusa Institute Library

A mycological herbarium comprising about 2,100 of over 900 distinct types of fungi and bacteria is housed in the Division of Mycology and Plant Pathology. Besides collaborating with the Botany Division in resistance breeding work, this laboratory does considerable work on disease-causing fungi, bacteria and viruses.

The laboratory of the Soil Science and Agricultural Chemistry Division is the largest at the Institute. The work done in this Division has led to the isolation and culturing of active strains of bacteria for particular legume crops such as berseem, sannhemp, *dhaincha* and peas, which are in great demand from farmers. "Butanol" and "acetone" have been prepared from molasses by the addition of groundnut cake by a suitable bacterial culture isolated in this Division. A cheap and efficient method by which cow-dung and other organic wastes can be used both as fuel and manure by the production of a combustible gas has been worked out in this Division. A collection of monoliths of typical soil profiles occurring in this country and those representative of the great soil groups of the U.S.S.R. is placed in its museum for the benefit of the students.

The Division of Agricultural Engineering is paying special attention to the improvement of indigenous agricultural implements.

TRACER TECHNIQUES

In recent years, a radio tracer laboratory has been set up in the Division for carrying out fundamental researches on soil fertility and plant nutrition by tracer techniques.

The Institute has started a scheme of All-India Soil and Land Use Survey, as a separate wing with the four soil correlation zones occurring in the country. The object is to put the Indian soil to scientific use, to classify the soils into defined types and other classificational units to establish and plot the different soil boundaries, to correlate and predict the adaptability of soils to various farming practices, pasture and forestry, and to determine their behaviour and productivity under different management systems.

The Institute has steadily produced an increasing number of qualified personnel. For the first twelve years from 1925 the number was 57, from 1937 to 1946 it was 106, and from 1947 to 1957 it stood at 564.

Offering all-round facilities for agricultural research and training and possessing a team of qualified experts, no other Institute in the country would have been better suited to be entrusted with the great task of producing scientific personnel commensurate with the country's needs. The day is not far off when India will no longer look to other countries for advanced training of its agricultural personnel.

spotlight on new cottons

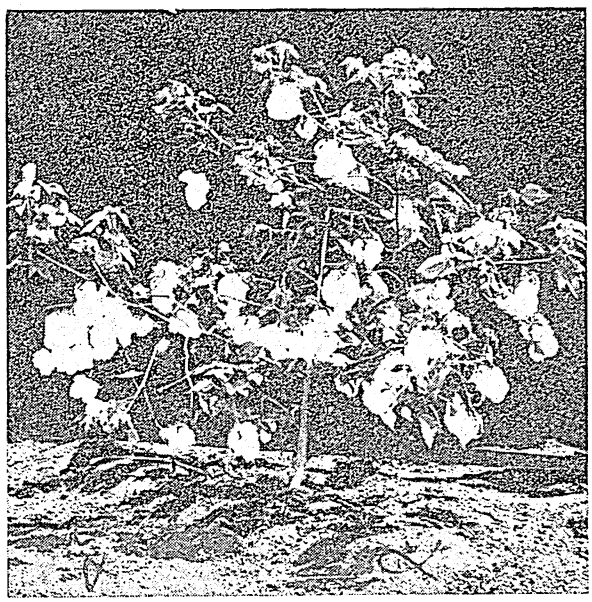
RESEARCH work on hybridization of Asiatic varieties of cotton with the American types was conducted at Surat and, as a result, two new strains of cotton have been evolved. They are *170-Co.2* and *134-Co.2-M*, now popularly known as Indo-American strains (*Deviraj* and *Devitej*), and have found immediate popularity with the farmers of Sabarkantha, Kaira, Panch Mahals, Baroda, Broach and Surat districts, as also of the Deccan canal area of Bombay State. *134-Co.2-M* is particularly suited to the light soils of North Gujarat, while *170-Co.2* has been found suitable for black and deep *goradu* soils.

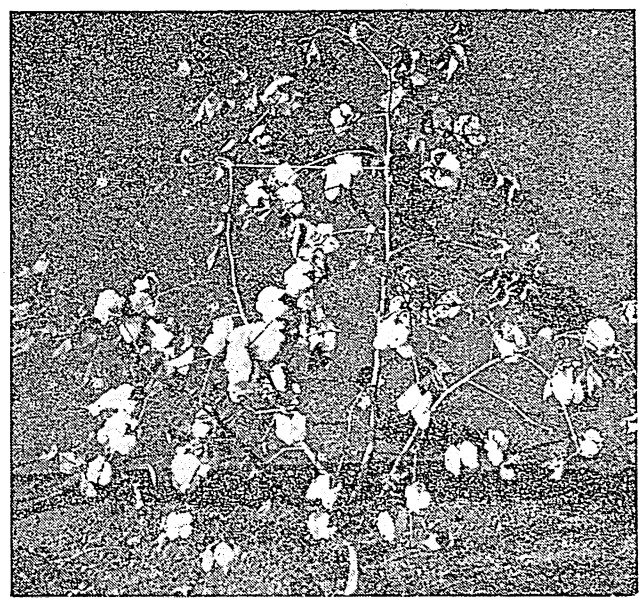
The characters of these two strains compared with *Laxmi*, a popular variety of the Karnatak area comprising the districts of Belgaum, Bijapur and Dharwar, are given in the following table.

Variety	Yield per acre in pounds		Ginning percentage	Staple length (in 32nd inch)	Fibre weight per inch millionth of an ounce	Average mill spinning capacity	Blow room loss percentage
	Kapas	Lint					
Laxmi	306	110	36	29 to 30	0.134	32	6
170-Co.2	1,046	387	36 to 38	32 to 36	0.129	36 to 38	5 to 8
134-Co.2-M	824 232	282 81	34 to 36	34 to 38	0.132	36 to 38	5 to 8

The Indo-American strains have combined extra long staple of the American variety with the hardiness and adaptability of the Asiatic cottons. Further, they possess a high degree of resistance to pests and diseases compared to the American types. Their superior qualities have earned for them great popularity in the tract, and their production has risen from 40,000 bales in 1954-55 to about 1,20,000 bales in 1955-56.

Further attempts are being made at the Surat Experiment Station to replace the existing Indo-American types by still better strains capable of spinning fine and superfine counts, thus overcoming the economic handicap from which these strains suffer in comparison with imported foreign cotton.





The hardy, adaptable and high-yielding duo *Devitej* (*above*) **and** *Deviraj* (*below*)

HORMONES FOR HIGH YIELD

RECENTLY, a new method of increasing cotton yields has been developed. This consists in the application of chemical hormones.

It has been found that application of these hormones inhibits the shedding of buds, flowers and bolls, which is a common feature in cotton, and thereby increases the yield to an appreciable extent.

The first practical results from this method were obtained in the Punjab and at Indore where *216F* and

(*Continued on page 25*)

Man of the Month

Farmer Rates Fertilizer Use High



by
M.G. Kamath

SHRI Sarikonda Madhusudan Reddy of Malkajgiri near Hyderabad City thinks that fertilizer use has the first place in better farming.

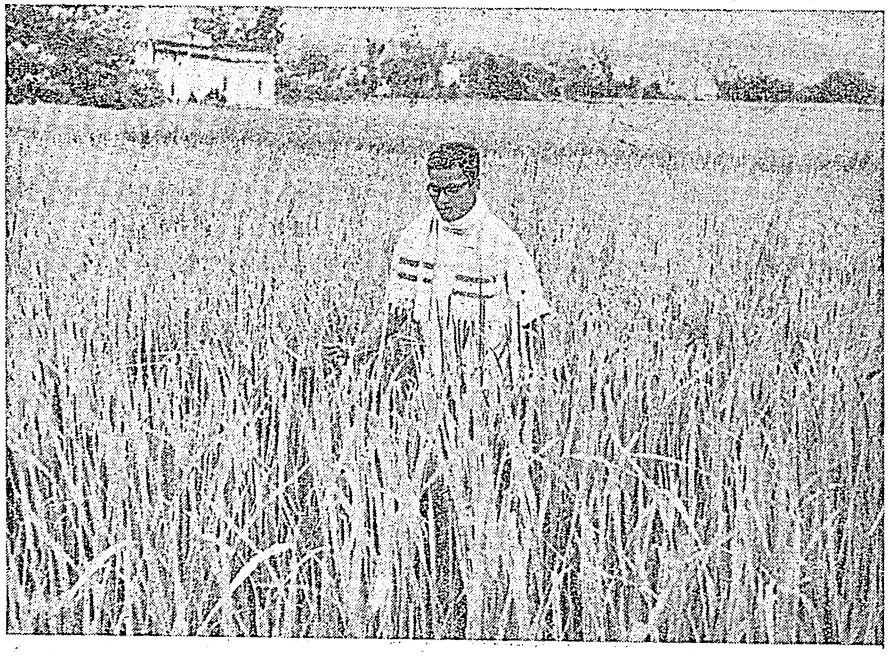
This young farmer who in 1942 preferred fighting for national freedom and working for village uplift to a good law career which he was pursuing at that time, has three reasons to support his statement:

one, he won the first prize in the State Potato Competition in 1952 by taking to good fertilizer use;

two, his paddy yields have shot up from 2,400 pounds to 3,680 pounds per acre;

three, his *Basrai* banana plantation started paying dividends only after he took to an intelligent fertilizer use.

This is how a good crop of rice should look like. Reddy fertilizes the crop, gets good yields



Madhusudan Reddy entered the Potato Competition "just for fun," but he took up the cultivation of the potato crop rather seriously. And, as he put it, "when a farmer takes to his job seriously, he is amply rewarded." And, in Reddy's case, the reward was 32 maunds of potatoes per acre and the first State prize for potatoes.



The *Basrai* banana is a paying crop; better paying, if properly fertilized

TEN PLOUGHINGS

In September-October, 1952, Reddy ploughed his one-acre plot ten times, applied 50 cartloads of rural compost and a 100 cartloads of composted pig-dung. In the Telengana area, pig-dung is considered an excellent manure. In addition, he applied three bags (166 pounds each) of groundnut cake and ploughed it in.

On the 23rd of November, he planted his potato crop. The seed was supplied to him by the Agricultural Department and came from Simla. The spacing he gave was one foot between rows and eight to nine inches between plants. The variety used was *Darjeeling Red Round*. He used 160 pounds as seed-rate.

GOOD AFTER-CARE

Two weedings and mulchings at fortnightly intervals followed. At mulching time, he applied two bags (200 pounds each) of superphosphate and one bag (224 pounds) of ammonium sulphate. After five weeks of planting, the crop was earthed.

After the earthing, Madhusudan Reddy gave three sprayings of "Guesserol" for the paddy beetle and "Diathene" for the potato blight.

In all, the crop received ten irrigations at ten-day intervals.

On the second of March, 1953, the crop was harvested.

FIRST SUCCESS

That was the first time that Reddy had tried potatoes on his black sandy loam soil. "Even for a first time I had success because I used good manures and fertilizers."

Reddy related a similar story with regard to his paddy. Yields were normally low, but when he took up a programme of good fertilization the yields shot up. For the paddy crop, Reddy raises a green manure crop of sann-hemp, "thereby diverting the available cattle manure to the orchard and vegetables," as the farmer explained. He applies a bag of super (per acre) to the sann-hemp crop which utilizes it and makes available the same to the paddy crop when it is ploughed in. While weeding, which he does thrice, he uses in all a bag of ammonium sulphate.

BEST CASH CROP

To the *Basrai* banana crop, which is his best cash crop, he applies the available cattle manure, and at suckering he gives a mixture of a bag of ammonium sulphate and a bag of superphosphate mixed with twice its quantity of earth. His reward lies in the big bunches he gets each of which fetches him anything between three and eight rupees in the market.

"An acre of bananas means a net profit of Rs. 3,000," explained Reddy.

"Fertilizers should form a must in the farming schedule of all farmers," is Madhusudan Reddy's advice to his neighbours.

PLEASE CORRECT

In the article "Two Jaipur Farms Find Good Use for Sewage" by R.P. Talati, published in the September 1958 issue of *Indian Farming*, page 19, col. 1, line 2 from below, the total soluble salt content for the southern farm soils is mentioned as 0.8 to 0.12 per cent; it should be 0.08 to 0.12 per cent. In the same article, on the same page, col. 3, line 12 from below, the nitrate content is mentioned as 2.5 per cent; it should be 2.5 parts per hundred thousand.

MEETING EVERY SITUATION IN PLANT PROTECTION

by

K.B. Lal

Plant Protection Adviser to the Government of India
New Delhi

THERE is a method to meet every situation in the control of pests and diseases of crops. There are mechanical methods, cultural methods, biological methods, chemical methods and even 'legislative' methods. If the occasion so demands, more than one type of method may be employed, successively or concurrently, to achieve the desired results. Some of the methods in each category aim at preventive control only, others attempt to provide quick relief by direct destruction of pest and disease organisms and still others do both.

Mechanical control includes removal and safe disposal of pest-infested or diseased plants or parts thereof by hand or by mechanical contrivances. Safe disposal means burning the plants, burying them underground, putting them in compost pits or using them in animal feed so as to eliminate the chances of reinfection of the crop. The removal of diseased plants from a field so as to ensure a healthy crop is called "roguing." Destruction of pests, either individually or in collections, is also a mechanical method of control.

Some examples of this type of control are pruning canker-affected citrus branches, removing earheads of wheat and barley affected by loose smut, roguing potato and tomato plants attacked by virus diseases, removing sugarcane shoots infested with top borers or sugarcane

Large areas of crops have recently been saved by spraying insecticides from the air. Here, a Piper Supercruiser is seen in operation over a cotton crop near Bhopal

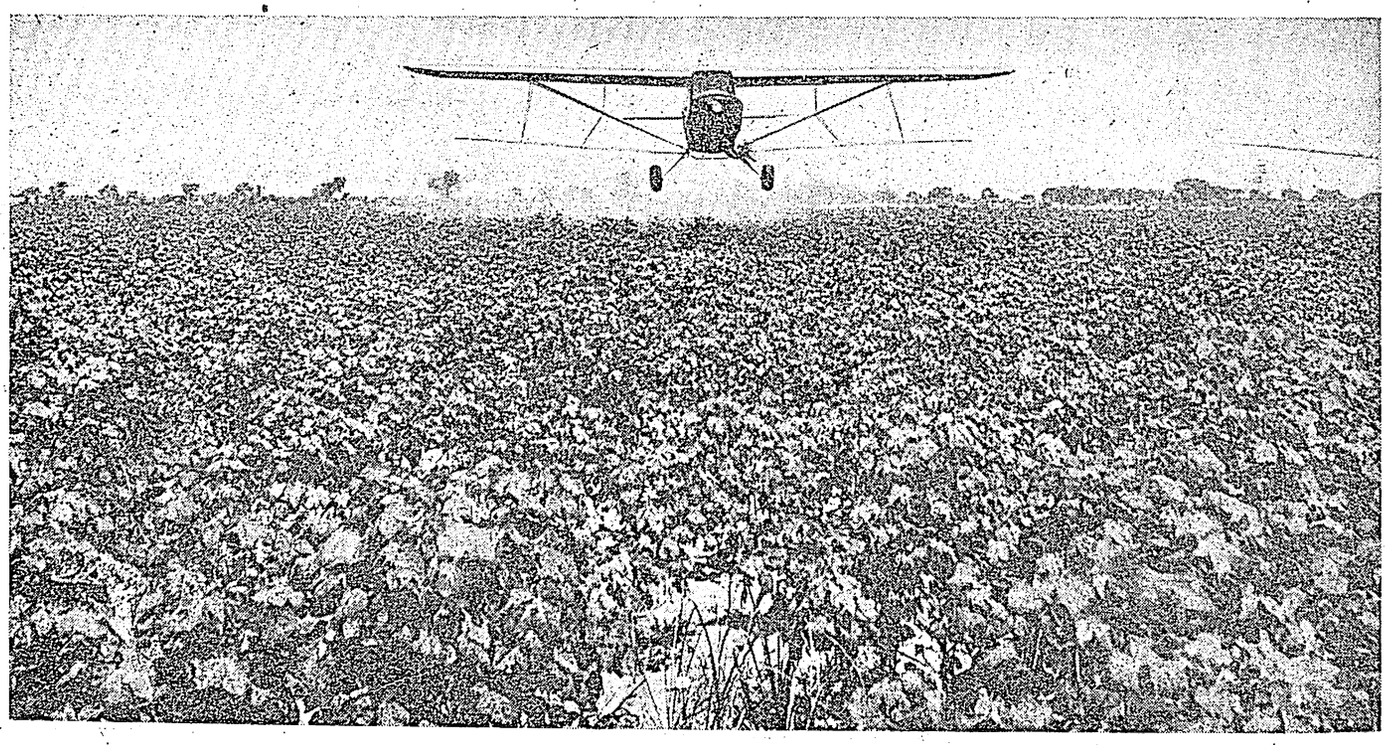


Photo: courtesy Burmah Shell

leaves bearing egg-masses of top borer or Pyrilla, killing rats after catching them in traps or by means of break-neck traps and collecting and destroying flying pest insects by setting up light traps during night.

Mechanical measures are generally recommended for kitchen-gardens and for small farms and orchards. However, they can be effectively employed in large-scale campaigns also if good organization and abundant labour are assured. Some of the mechanical measures such as roguing, removal of weeds and pruning can also be regarded as cultural since they involve modification or intensification of routine cultivation practices.

CULTURAL CONTROL

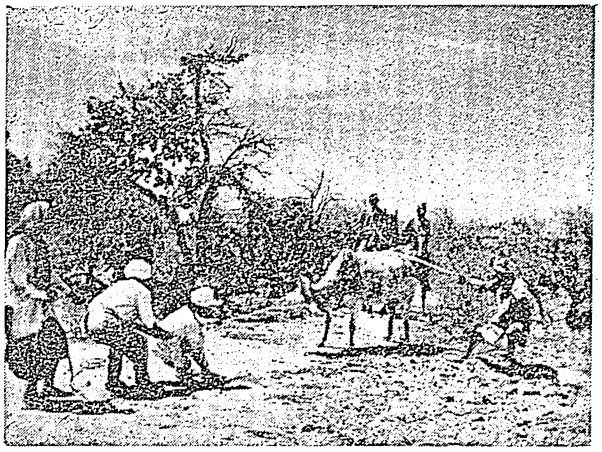
Damage to crops by pests and diseases can be minimized by adopting or introducing measures which may constitute modification of existing cultivation practices, including use of pest- and disease-resistant varieties. Such measures, placed in the category of cultural methods, may include proper preparation of land so as to remove pest- or disease-harbouring stubbles and other plant materials, early or late sowing or harvesting of crops, judicious use of manures and fertilizers and irrigation water, good drainage, removal of weeds and alternate host plants of pests and diseases, etc.

Some of these and other measures may achieve control by creating ecological conditions unfavourable to pests and diseases. These have been described as ecological methods of pest and disease control. For example, proper spacing of sugarcane plants and mango trees may reduce the incidence of Pyrilla and mango hoppers, respectively, by providing adequate sunlight and air in the field and in the orchard. Except in the case of storage pests, ecological conditions are generally created by manipulations of cultural practices.

Crop and fruit varieties show varying degrees of resistance or susceptibility to pest and disease attacks. This fact has been exploited to produce varieties which may combine pest- or disease-resistance with other desirable characteristics.

However, the success achieved with this method has not been commensurate with the efforts expended on it. Resistance produced by selection, hybridization or breeding is comparative or relative in its effect and there is hardly any such thing as complete immunity from the attack of a pest or disease. It is not always combined with other desirable characteristics in a variety and, being greatly dependent on conditions of soil and climate, is seldom stable over any long period or large area.

Above all, as new resistant varieties are put into cultivation, new races and strains of pests and diseases capable of attacking them with virulence make their appearance. This is what has happened in respect of the red rot disease of sugarcane, though experience with cotton wilt and wheat rusts has been better. The role of resistant varieties in plant protection is extremely limited, being conditioned by a variety of factors not easily determined or controlled.



Wild animals are as dangerous to crops as any other pest. Picture shows farmers near Patiala capturing a wild bullock

BIOLOGICAL CONTROL

The method involves encouragement or liberation of the natural enemies of animal or plant pests so as to bring down the population of the latter to the point of harmlessness. It is not applicable to plant diseases. The natural enemies may be of animal, fungal, bacterial or virus origin, and may attack and destroy pests so as to rid areas of them for several years if not for longer periods, thereby obviating the need for recurring seasonal control measures.

Of the animal enemies, by far the most important in agriculture are insect predators and parasites. The distribution of cultures of fungi, bacteria and viruses among populations of insect and rodent pests has not been effective, chiefly for the reason that climatic and other conditions which may favour the growth and development of the enemy organisms are not always necessarily those under which the pests may multiply and cause damage.

The chances of insect enemies destroying animal and plant pests on a large scale are, however, much greater and many notable successes have been achieved in many parts of the world. The most spectacular example has been the control of the cottony cushion scale pest of citrus by a lady-bird beetle predator in California, India and other areas. A minute, black wasp, called *Trichogramma*, has been extensively tried in many countries, including India, to parasitize and thus destroy the eggs of moths whose caterpillars cause severe damage by boring into sugarcane, paddy, maize and other plants. However, the performance of this parasite against sugarcane borers in India has been on the whole disappointing.

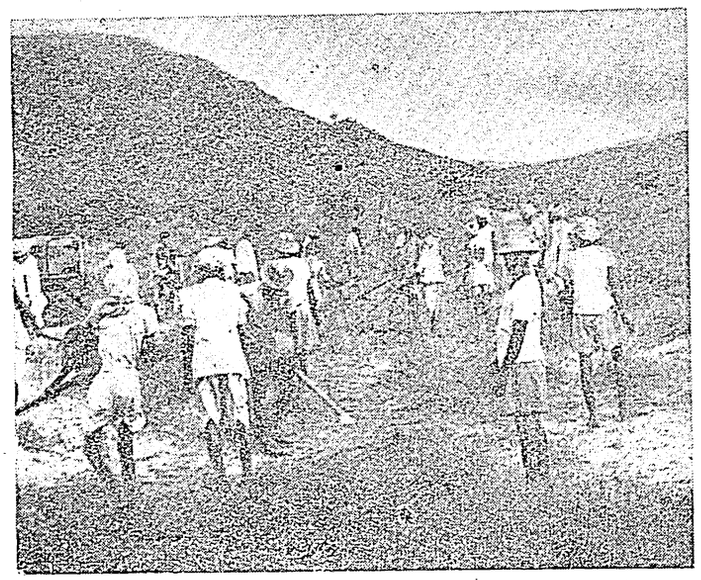
CHEMICAL CONTROL

Chemical control involves the use of chemical and other poisons for spraying and dusting crops and plantations, poison-baiting against locusts, rats and other pests, fumigating stored commodities, prophylactic and other treatments against storage pests and seed-dressing against seed-borne diseases. The poisons, collectively called

pesticides, are not necessarily all chemicals nor even poisons in the accepted sense of the term as, for example, fish-oil-rosin soap, pyrethrum and sulphur. However, most of the pesticides now in use are chemicals and practically all of them are poisons, some very deadly as, for example, organo-mercuric and organo-phosphorus compounds, hydrocyanic acid and methyl bromide.

A group of insecticides (pesticides effective against insect pests) derived from vegetable products is comparatively harmless. The most notable example is that of pyrethrum, though derris, castor seed oil, tobacco and many such others have also been in use. Such insecticides, however, are no longer popular in view of the development of synthetic organic chemicals.

Since 1945, a large number of insecticides based on chlorinated hydrocarbons and organo-phosphorus compounds and fungicides (pesticides effective against fungus diseases) based on organic preparations of mercury and copper, have been developed and put into use.



An anti-locust campaign in progress in Rajasthan

In most cases, pesticides have to be used by spraying, dusting and seed-dressing machines and with various other equipments for the fumigation of commodities and rodent burrows. Considerable advance has been made during recent years in application techniques, which have been considered at least as important as the selection of a satisfactory pesticide.

Machines, operated by hand, foot or power, have been developed for spraying and dusting and special gadgets have been invented to spray large areas with relatively small quantities of spray liquids (low-volume spraying). Machines for generating fogs and blowing mists of pesticides have come into use and aeroplanes have been employed for the spraying or dusting of pesticides on crops and plantations and on the ground from the air. An "exhaust sprayer" has been developed, which, taking power from the exhaust pipe of a jeep or landrover, can spray relatively large areas with relatively small quantities of insecticides against locusts.



Spraying against locusts

The chemical method of control has been and is the most popular of all the methods because it provides quick and often spectacular relief from pest and disease attacks. It does not involve any heavy financial outlay or much foresight on the part of farmers; it is relatively easy to practise and the results are quick. Its use, however, involves hazards attendant on the use of all poisons, but with proper care and precautions these hazards can be eliminated.

LEGISLATIVE METHOD

The legislative method is not exactly a method, but employs measures which governments sometimes adopt for the prevention and control of pest and plant disease outbreaks. They include laws and regulations to prevent the introduction and spread of dangerous pests and diseases into an area from a foreign or indigenous source (plant quarantine), to require certain control operations to be individually or collectively undertaken by farmers of a certain locality at any specified time, and to regulate or prohibit the growing of certain crops in certain areas during certain seasons or years.

Since legislative measures involve an element of compulsion, it is of the utmost importance that three conditions are fulfilled before they are resorted to. First, the necessity for the measure and its operational procedures must be technically established; secondly, means must be placed within easy reach of farmers to enable them to adopt the measure; thirdly, publicity and propaganda about the measure must precede enforcement of any legislation or executive order.

Apart from plant quarantine, which usually does not directly affect the general run of farmers, it may be stated that if a measure is effective, practicable and economical and if it has been well demonstrated and shown to be useful, there would hardly be any necessity to compel any one to adopt it.

Where There's Water, There's the Paniala

by
M. D. Chaturvedi

WHERE tigers abound, they are usually found clearing their claws by digging them into the soft, astringent bark of the *paniala*.

Inhabiting swamps, river banks and moist localities, the *paniala*, as its very name suggests, is a tree that grows where there is plentiful moisture.

It occurs freely in the wet areas of the submontane tracts of the Gangetic basin extending eastwards to Assam in the valley of the Brahamaputra and southwards to Chota Nagpur and the Deccan. In the south, it is met with the evergreen species of the Western Ghats. It does not prosper in the hot and dry basin of the Indus.

The tree is known by a variety of names: *kaen, pankain, kot semla irum, paniala, bhillar*, Hindi; *uriam*, Assamese; *gobra nerul, nilimara*, Kanarese; *thondi, milachittyam*, Tamil. Its scientific name in Latin is *Bischoffia javanica*.

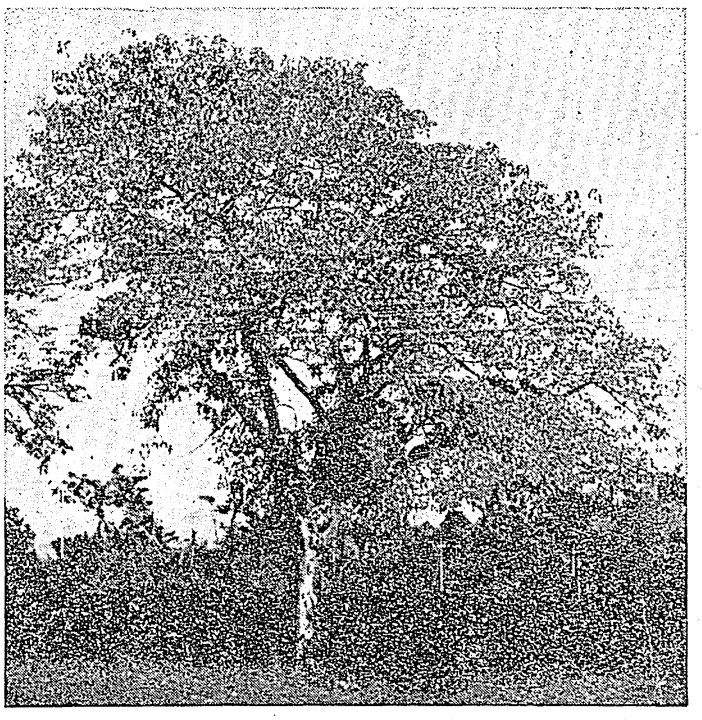
The *paniala* is a deciduous tree with a large shady crown and shiny leaves, dark green in colour. Each leaf has three leaflets. In moist localities, it tends to become evergreen. Its bole is fairly straight and clean, covered with dark grey bark, fairly smooth outside and fleshy, juicy and astringent inside.

The tree is leafless during winter for a short duration, more particularly in areas of low rainfall. The leaves turn red before falling. In the Gangetic basin, shrill green leaves appear during February and March, followed by minute flowers appearing in pendulous clusters. Fruits are in profuse evidence during the cold weather and ripen by the following February. The seed is light brown, smooth with one rounded and two flat sides, weighing about 2,500 to an ounce.

The seeds germinate easily in moist localities and yield a high percentage of seedlings. Plentiful water is an indispensable condition for their development, as also full overhead light. If the water supply is limited, the young seedlings soon wither away and disappear.

The *paniala* can stand shade and moderate frosts, but no drought. It can struggle through weeds characteristic of moist localities. The tree coppices well and throws up good healthy shoots.

In areas covered with forests, the seedlings thrive best under moist conditions on fresh alluvium and in loose soils. In the early stages of development, they have to contend with fearful weed competition.



The *paniala* can be easily propagated by means of transplants raised from seed in nurseries. Direct sowings of seeds cannot be relied upon, as the seed is much too tiny and is apt to be washed away. In the nurseries, plentiful irrigation, regular weeding, loosening of soil and shading against the sun invariably yield excellent results.

The *paniala* yields excellent and durable timber for constructional purposes, river craft and underwater structures such as piles and bridges.

Madurai Doesn't Waste Its Sewage Or Sweepings

by

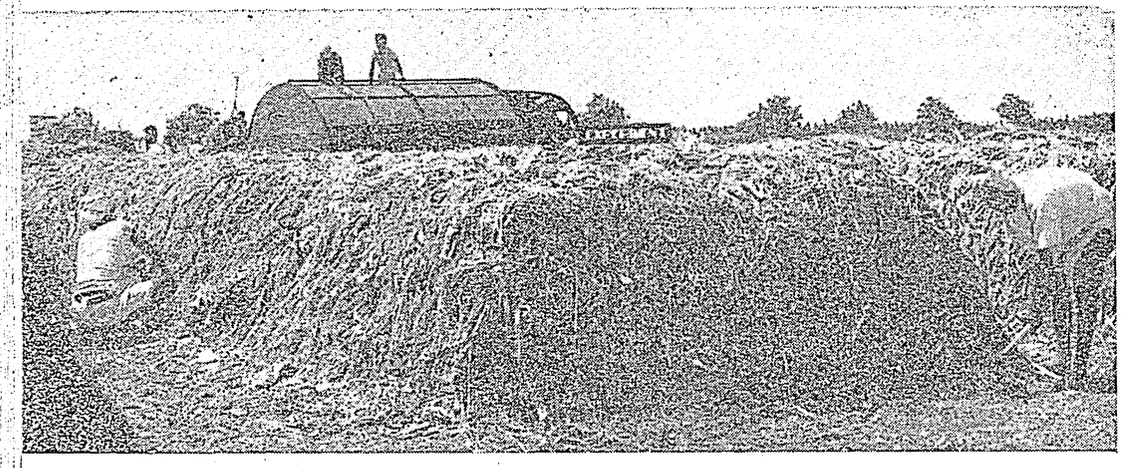
R. P. Talati
Compost and Sewage Development Officer
Ministry of Food and Agriculture
New Delhi

PUTTING aside all prejudice, the Madurai Municipality in Madras State has been seeing to it for the last five years that all the refuse and sewage of the town are properly utilized for crop production. Recently, the Municipality, covering a population of 3.61 lakhs, was adjudged the best in the State for producing the maximum and high grade compost, and was awarded the rolling shield of 1957-58 by the State Government.

This is how the Municipality operates. The town refuse and night-soil are carried mostly in fast-moving vehicles, to the compost yard situated about five miles from the town abutting a cemented concrete highway. The total area of the compost yard is about 40 acres. This area is divided into 12 blocks, each block accommodating the town refuse and human wastes for one month for production of compost manure.

Raw materials used in building compost piles are street rubbish, night-soil, sceptic tank sludge, silt from the sewage pumping station, cotton wastes from Madurai mills, carcasses of electrocuted dogs from the Municipal Lethal Chamber, etc.

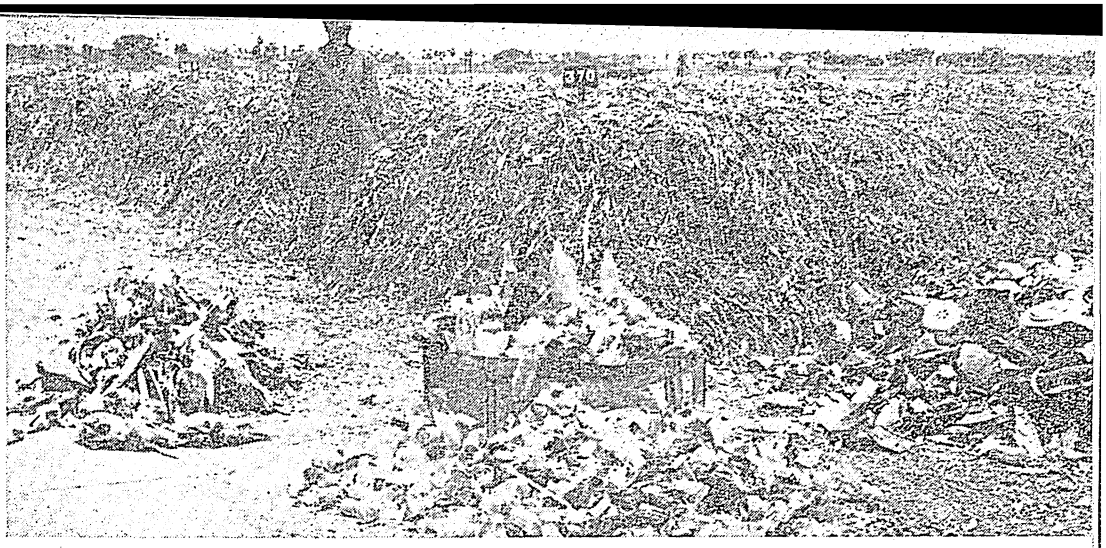
A few gallons of water are poured into the tank before putting the night-soil into it. During transit, high emulsification occurs. The refuse layer when treated with this starter provides ideal moisture conditions for a quicker and more efficient decomposition. Compost piles of 35 feet × 10 feet × 4½ feet are built up. Every day five such heaps are completed.



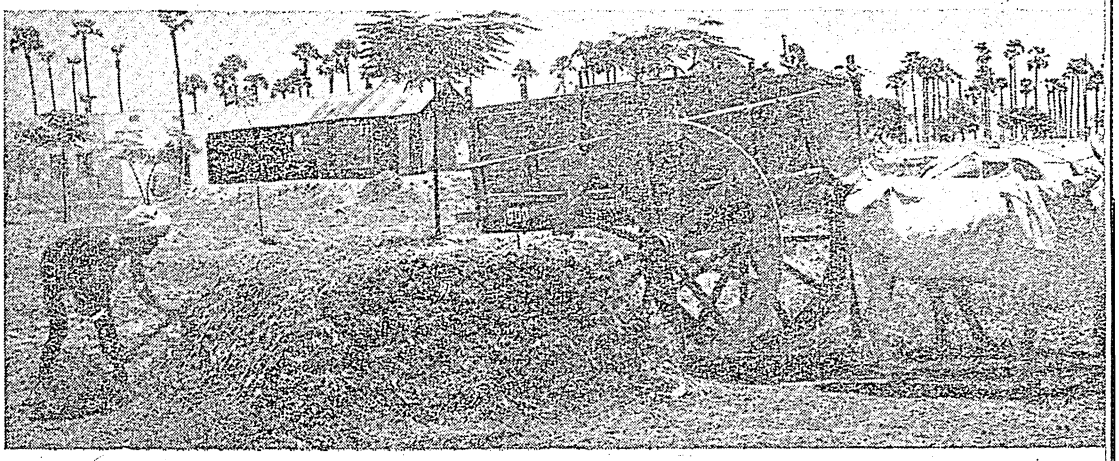
Giving finishing touches to a compost pile



Night-soil is used as starter in the compost piles at the Madurai compost yard



Materials that cannot be used in composting are not wasted: while bones and broken glass pieces are sold and bring in some revenue, others are put to a good use on the yard itself



Compost is now ready, and a farmer-buyer is seen loading it into his cart

The staff that looks after this work comprises one Compost Inspector, four Compost *Mistries*, three watchmen, one clerical attendant and 49 *mistries*.

The following quantities of compost manure have been produced and distributed to farmers during the last five years.

Year	*Produced* (*tons*)	*Distributed* (*tons*)
1953-54	27,426	22,590
1954-55	29,093	24,447
1955-56	29,669	34,018
1956-57	33,000	35,824
1957-58	33,120	35,080
Total	1,52,388	1,51,959

The manure is sold to farmers at a very reasonable rate and they take it away in their carts. The fact that almost all the manure produced was sold away shows how popular it is among farmers. A 1,000 farming families from adjoining villages are estimated to have taken advantage of this facility.

GOOD INCOME

During these five years, the income of the Municipality by the sale of manure amounted to about 3½ lakhs of rupees, and it incurred an expenditure of about Rs. 2¼ lakhs. In addition, the Municipality spent about thirty thousand rupees on the improvement of the compost yard.

Care is always taken to produce compost manure of good quality. All foreign materials are carefully removed from the town refuse before composting, and usable materials sold or utilized. Flood banks on the periphery of the compost depot were built with pebbles and other such materials recovered in this way, and this bund has proved very useful in stopping erosion of the compost yard ground.

Ripe samples of compost are tested from time to time in the Public Health Laboratory, and the workers subjected to a thorough medical examination. This may provide valuable data after a few years. The Municipality provides workers with footwear, dress, goggles, coaltar soap and gingilli oil with soapnut powder.

TRAINING CENTRE

The Madurai Municipal Compost Depot also serves as a centre for training Executive Officers and Sanitary Inspectors of the southern districts, Municipalities and *panchayats*.

A total of about three million gallons of sewage is pumped to the Avaniapuram sewage farm five miles south of the city. The area of the sewage farm is about 179 acres. Originally all under perennial grass, the cropping scheme on the farm has now been improved and rotational

(*Continued on page 22*)



Five-month old crops of *Co. 527* and *Co. 997* sugarcanes

Enter Co. 997, Exit Co. 527

by

M. Lakshmikantham
and J. V.V. Suryanarayana
Sugarcane Research Station
Anakapalle

A TON of sugar more from an acre—that's what the *Co. 997* variety of sugarcane gives compared to *Co. 527*, when crushed in December in Andhra Pradesh.

It is admitted on all hands that the best way of producing more sugar is by commencing the crushing of sugarcane earlier than usual and not by prolonging the crushing season into the severe summer months. It is here that the need for early-maturing varieties makes itself felt.

Experiments were started at the Sugarcane Research Station, Anakapalle, in 1956-57, with this end in view, and in these trials, *Co. 997* has outbeaten *Co. 527* by giving a consistently good performance.

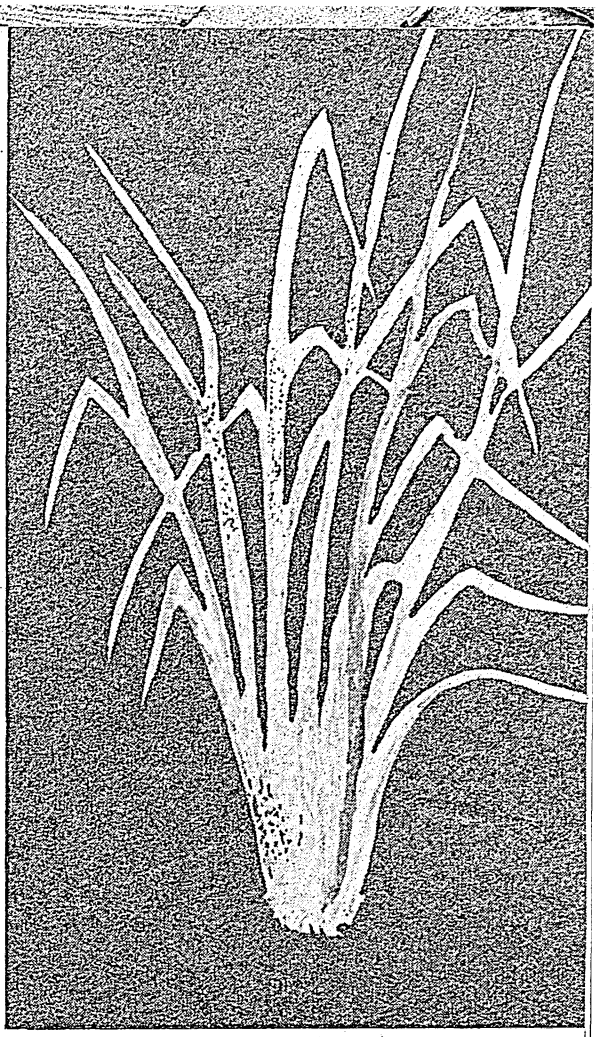
Co. 997 is a medium thick, fairly tall-growing variety, with a better early vigour than *Co. 527*. *Co. 997* has no spines on the leaf-sheaths and has a solid core, whereas *Co. 527* has a carpet of spines on sheaths and develops much pith and even hollow late in the season. Hence, *Co. 997* is being spread in all the sugar factory areas of Andhra Pradesh.

To see how farmers liked the new variety, a small quantity of seed material of *Co. 997* was given for trial to an interested cultivator in the Etikoppaka Sugar Factory area. He planted it in about 20 cents and realized 9½ tons of cane from this plot with about 19 per cent sucrose in juice. He replanted a major part of the cane material for seed purposes and has now put a larger area under this variety. He is immensely satisfied with its performance and says that he saves about eight rupees per acre in wrapping this crop compared to *Co. 527* which the *mazdoors* dislike because of the spines on its leaf-sheaths.

Particulars	*Co. 997*	*Co. 527*
Per cent germination	49.0	40.57
Length of millable cane in inches	122	125
Average circumference in inches	2.34	2 14
Stalk population per acre	33,100	33,411
Cane yield in tons per acre	43.85	40.64
Percentage of sucrose in juice in December at the age of about 9½ months	19 58	17.87
Coefficient of purity	97.02	94.20
Percentage of C.C.S on cane weight	14.51	13.07
Estimated yield of C.C.S. in tons per acre	6.36	5.31
Toleration to water-logged conditions	Tolerates water-logged conditions in monsoon months. (From August, when the cane is six months old, till November)	The crop does not appear to withstand swampy conditions. Yield is markedly lowered

This farmer tried the *Co. 997* sugarcane and found that the variety was much better than *Co. 527*





Foot Rot has completely killed this rice plant

Tackle Foot Rot, Save The Rice Crop

by
Kishan Singh Bedi
Plant Pathologist, Punjab
Chetan Swarup Pracer
Assistant Professor of Botany
and Jaswant Singh Chohan
Research Assistant
Government Agricultural College, Ludhiana

A FIVE per cent loss, and that is a conservative estimate, is caused to the rice crop in the Punjab by the Foot Rot disease of rice, locally known as *sarand* or *tane ke nichle hisse ka gal jana*. The damage is often as high as 20 per cent in the districts of Kangra, Gurdaspur, Amritsar, Karnal and Kapurthala.

The disease is caused by the fungus *Fusarium moniliforme* Sheld. It is noticed in the fields just after the transplanting of the rice crop, and is a manifestation of the symptoms starting in the nursery. It affects the basal portion of the rice plant and causes the rotting of tissues in that region. As a result, all the tillers wilt and die either one by one or all of them simultaneously and suddenly. Under Punjab conditions, the disease has been observed to assume a serious form during the first month after transplanting.

On splitting open the culm of an infected tiller, a distinct brown discolouration of the spongy tissues of the nodular region is observed. Most of the infected plants show externally on the internodes and leaf-sheaths a white or pink or blue bloom of fungal growth with dot-like sporodochia containing the spores of the causal fungus. This symptom of the disease is not uncommon in the Punjab State. Dead plants on being pulled out break at the collar leaving the roots behind. The infected plants that may survive till the end, generally produce no panicles. If, however, the infection appears late in the season, the diseased plants produce incompletely-filled panicles, or panicles with no grains at all.

The causal fungus of the disease survives mainly in the form of spores which adhere to the surface of the grains when the healthy panicles are threshed along with the diseased plants. Small bits of diseased debris also get mixed with the threshed grain. The causal fungus remains viable during storage of the grains and serves to initiate primary infection in the new crop raised from the infested seed next year.

Soil infestation due to diseased debris remaining behind in the fields has not been observed to play a significant role in the perpetuation of the disease under Punjab conditions. Experiments have revealed that the incidence of the disease arising from this source of infection is negligible.

FACTORS RESPONSIBLE

The intensity of the disease has been observed to be increased by

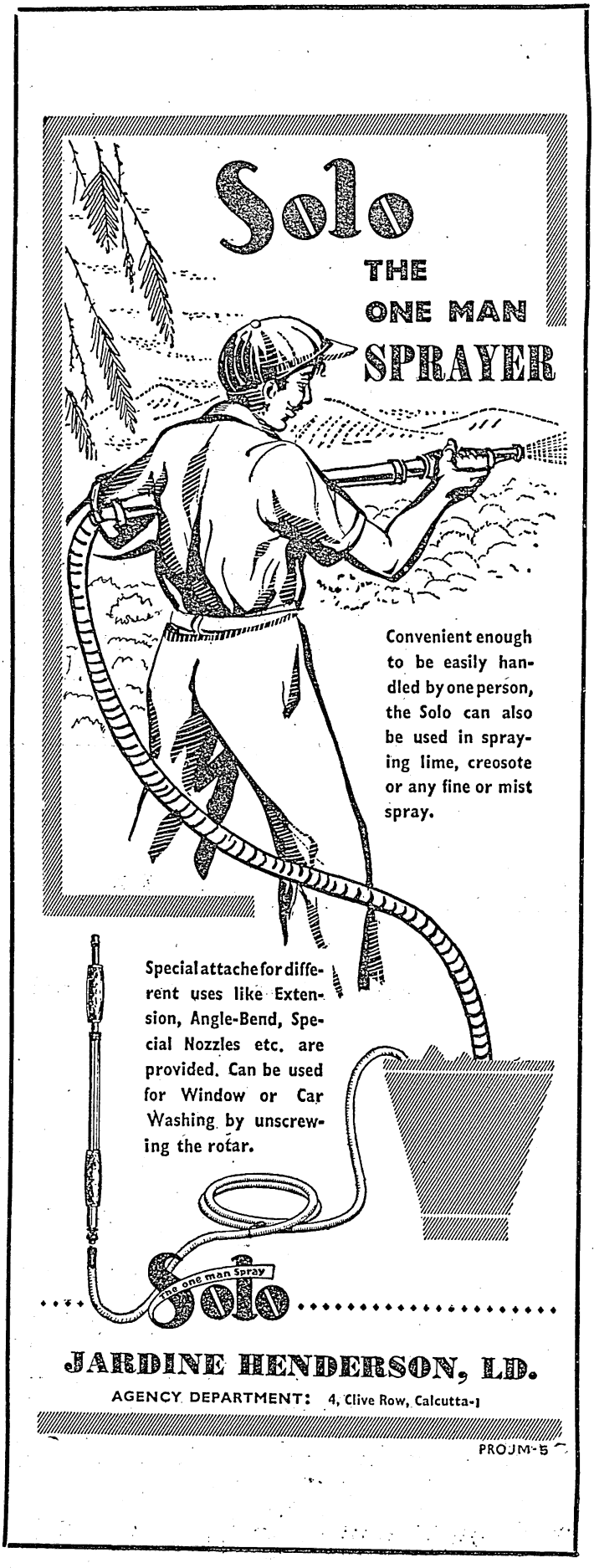
transplanting of the crop very early, i.e., by mid-June,

prolonged stagnation of water in the fields after transplanting,

poor soils, which produce a poor crop and are prone to the attack of the disease to a greater extent than those supporting a good and luxuriant growth of the crop, and

diseased plants, which when not removed promptly from the fields begin to rot and produce successive crops of spores of the causal fungus and serve as foci of secondary infection for the surrounding healthy plants. Also, irrigation water disseminates these spores widely in a field and new plants are infected.

As the disease is mainly seed-borne, the seed before sowing must be dressed with any of the good organic mercury dusts like "Ceresan" or "Agrosan G.N.," the ratio of the fungicide and the seed being 1 : 400, i.e., one part of the fungicide for 400 parts of the seed, or say, one *chhatak* of it for 25 seers of the seed. The seed may be dressed just before sowing or even a month or two earlier, but in the latter case, it has to be ensured that till sowing time the seed is stored under dry conditions.



TREATING THE SEED

The fungicidal dust can be effectively applied in a special rotary type mixer. The seed and the dust are shaken by revolving the rotary drum mounted on a stand for three to five minutes. One revolution should be in one direction and the second in the reverse direction to obtain a thorough coating of the grains with the fungicide.

If the mixer is not available, the seed along with the dust can be vigorously shaken for about five minutes in an earthen vessel, the mouth of which should be kept tightly closed with its lid during the treatment. A closed metallic or wooden drum can also be used for this purpose. The drum is rolled to and fro on the ground for about five minutes.

The treating vessel must not be filled completely but only two-third to facilitate a thorough mixing.

The treated seed is fit for sowing only, and not for consumption or for feeding to cattle. To avoid inhalation of the fungicidal dust, the operator should wear a mask or keep a handkerchief over his mouth and nose.

The mercurial dusts should not be handled with wet hands and also not allowed to come into contact with wounds or broken skin. Preferably, gloves should be worn.

Sacks which had contained treated seed, should be thoroughly washed before being used for carrying foodstuffs. The treatment should be carried out in the open, or in a well-ventilated room.

Before dressing the seed with a fungicidal dust, it is preferable to remove the diseased light grains and bits of diseased straw by winnowing or by floatation in water ; the grains in the latter case should be thoroughly dried before applying the fungicidal dust.

TRANSPLANTING TIME

The date of transplanting of the rice crop has been observed, under Punjab conditions, to exercise great effect on the subsequent incidence of the disease. Early transplantings made up to the middle of June suffer much more damage than those carried out about three weeks later, i.e., during the first week of July.

If seed-treatment is combined with the right time of transplanting, the chances of infection are very much reduced, though some diseased plants are likely to appear here and there in a field. Such plants constitute a potential danger to the surrounding plants and must be removed as soon as detected and destroyed, preferably by burning.

REGULATED IRRIGATION

It is an erroneous notion that the rice plants must always have water standing in the fields. A regulated water supply to keep the soil moist by more frequent shallow irrigations has been found to be much better than heavy irrigations which result in prolonged stagnation of water in the fields. This condition certainly leads to

(*Continued on page 25*)

IT'S EASY TO STORE YOUR SEED-GRAINS SAFE

by

S. Pradhan and P. B. Mookherjee

Division of Entomology

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HOW would you feel if you found the seed stored by you eaten away by insects ? That certainly wouldn't be a happy situation. Fortunately, however, you can protect your seed-grains more easily than your food-grains, because whereas chemically treated food-grains are never completely free from possible hazards to the consumer's health this serious limitation does not exist in the case of seed-grains.

In treating seed-grains, two main things to be kept in view are: firstly, the chemical should kill any insect pest already present in the seed and should continue to kill all further intruders from time to time ; secondly, it should not in any way impair the viability of the seed during storage, nor, when sown, adversely affect the plant growing out of the treated seed. Investigations have been directed towards these two objectives during the last few years and useful results achieved.

Besides precautions like proper conditions of storage and storing of comparatively dry seeds, insect infestation in stored seed can be controlled: one, by fumigation, which is resorted to either to disinfest the grain before storage or to kill the infestation which has already taken place in the stocks; two, by treating seed with chemical dusts to keep on killing insect intruders from time to time.

FUMIGATION

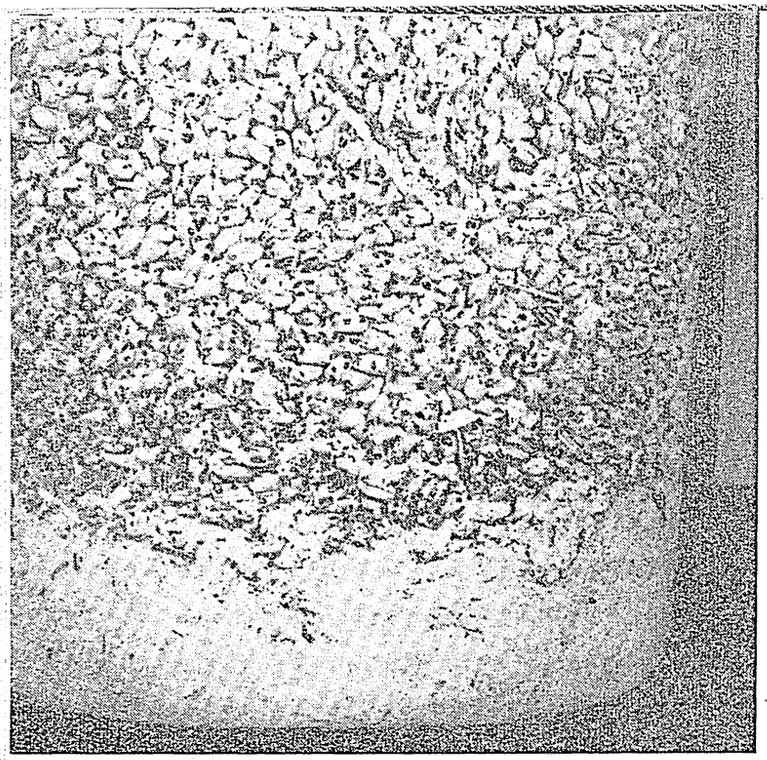
Investigations have been continued for varying lengths of time on eight seed-grains of the *rabi* season, viz., wheats *NP 165* and *NP 718*, barley *NP 13*, gram *NP 58*, peas *NP 29*, oats *Hyb. I*, lentil *Hyb. L*, linseed mixed and mustard (commercial variety), and four different seed-grains of the *kharif* season, viz., *urid NP 6*, cowpeas *K 397*, *rahar* mixed and maize *Yellow 2*. The fumigants used were HCN, CS_2 and a mixture of ethylene dichloride and carbon tetrachloride (EDCT) ; the dusts were ten per cent DDT, 15 per cent DDT, 0.5 per cent gamma BHC, 0.5 per cent dieldrin and 0.2 per cent pyrethrins.

These various chemicals have been tried at different rates and, in some cases, in different manners, and it has been observed on the whole that although all treatments have some beneficial effects, the actual degree of protection of the seed-grains against insect pests varies from treatment to treatment and from place to place.

When grains like wheat, barley, oats, gram, peas, mustard, *urid*, *rahar*, cowpeas and maize are fumigated with the recommended doses of the three fumigants, viz., ten pounds of HCN, 30 pounds of CS_2 and 40 pounds of EDCT per 1,000 maunds of grain with an exposure period of 24 hours and kept stored under normal conditions for one full season of storage, it is found that these fumigations do not result in the impairment of the viability of the seeds except in the case of oats, *rahar* and peas in which the viability may at times be impaired with HCN.

The limitation of these treatments, however, is that the grains remain free from subsequent infestation only for two or three months ; thereafter, not only are they slowly reinfested but in some cases the infestation becomes as bad as in untreated seeds. Even a 50 per cent increase in these recommended doses makes no material difference either in the period of safety or in the adverse effect on seed-viability except in the case of *rahar* wherein in one case the viability was found to be adversely affected with an increased dose of CS_2.

Fortunately, however, these seed-grains can tolerate very much increased doses, repeated fumigations and very long exposures. It was quite interesting to find that no impairment in viability was observed after the normal period of storage in all the four grains tried, viz., wheat *NP 718*, barley *NP 13*, gram *NP 58* and peas *NP 29* (the first three roughly at ten per cent moisture



Insect pests can reduce your stored wheat to near powder

content and the last one at 13 per cent moisture content) even when these seeds were subjected before storage to (*a*) fumigation with as high a dose of EDCT as a 100 pounds for a 1,000 maunds or (*b*) fumigation for as long a period of exposure as seven days with the recommended dose of EDCT, namely, 40 pounds for a 1,000 maunds of grains. The viability of these seed-grains was also not impaired when the same stocks of these seeds were subjected to repeated fumigations with the recommended dose of EDCT ten times at fortnightly intervals during its normal period of storage.

Thus, on the whole, it can be confidently concluded that except in the case of peas, oats and *rahar*, in which the tolerance performance has not been constant, there is very little risk involved in fumigating the above-mentioned seed-grains with normally low moisture content, especially with EDCT. Of course, for protecting seed-grains with the help of fumigants one has to keep examining the stock from time to time and repeat the fumigation as and when necessary.

DUSTING

Experiments have been carried out for four consecutive years on the safety from insect pests and viability of twelve different seeds, viz., wheat, peas, gram, barley, oats, lentil, linseed, mustard, *urid*, *rahar*, cowpeas and maize treated with the generally recommended doses of three insecticides, namely, ten per cent DDT dust at the rate of one part of the insecticide per 1,000 parts of grain by weight, 0·5 per cent gamma BHC at the rate of one part of the insecticide per 6,400 parts of grain by weight and 0·2 per cent pyrethrins at one part of the insecticide per 800 parts of grain by weight.

It has been found that after a period of storage of about six months whereas the infestation in the untreated wheat ranged from 13 to 31 per cent, it remained between 1·8 and 5·85 per cent in wheat treated with DDT, 14·43 and 29·2 per cent in that treated by gamma BHC and 11·53 and 13·15 per cent in that treated by pyrethrins. The same experiment carried out at Pusa (Bihar) for one year showed that there was no infestation in wheat treated with DDT and also in that treated with 0·5 per cent dieldrin used at the rate of one part of the insecticide per 1,000 parts of the grain by weight; in the case of pyrethrins, it went only up to five per cent, whereas the infestation in the untreated wheat was about 54 per cent. One apparent reason for the better control obtained at Pusa than at Delhi is that whereas at Delhi the main pest is *Trogoderma* (*khapra*), this resistant species is not common at Pusa where *Calandra* is the predominant pest.

In the other grains, the control was not so successful. In the case of *urid*, the infestation in the untreated grain rose to 81 per cent and the infestation percentages in

This is what happens when *Calandra* attacks your wheat



Damage typical of the *khapra*

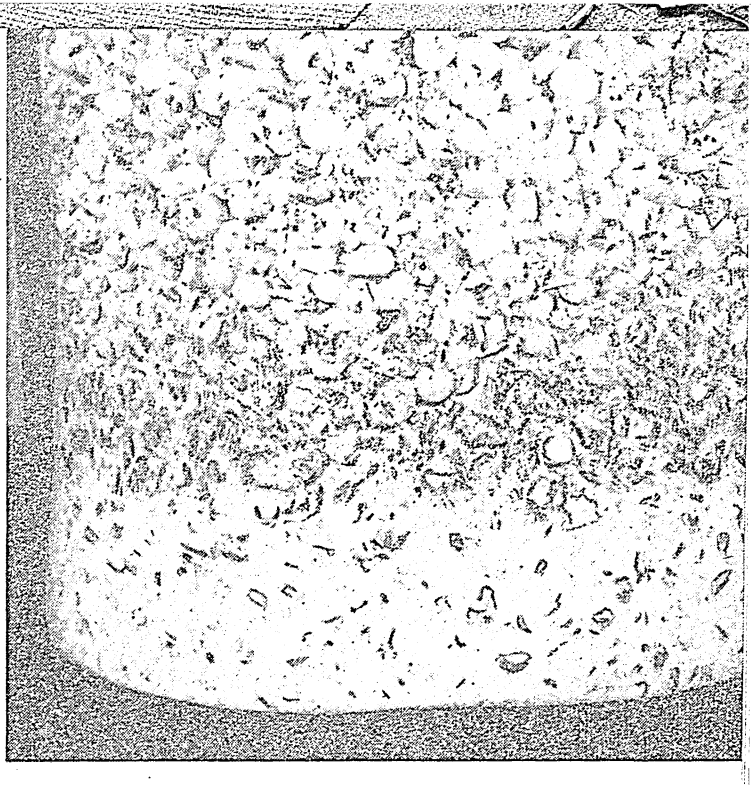


seeds treated by DDT, BHC and pyrodust were also as high as 44, 65 and 75, respectively. In the case of *rahar*, the infestation in the untreated grain reached 53 per cent and the infestation recorded in seeds treated by DDT, BHC and pyrodust were also quite appreciable, i.e., 31, 59, and 22 per cent, respectively. In maize, the infestation percentage remained 16, 45 and 17 in seeds treated by DDT, BHC and pyrodust, respectively, whereas that in the untreated seeds it rose to 81. Similarly, in cowpeas, the infestation recorded was 61, 79 and 49 per cent in grains treated by DDT, BHC and pyrodust, respectively, against 86 per cent in the untreated grains. In the other seed-grains, appreciable infestation did not take place even in the untreated grain.

The viability of all these treated seed-grains remains unimpaired in all except linseed in which there was some indication of viability being impaired by DDT.

An increase in the above-mentioned recommended doses of these insecticides did not result in any material change either in the degree of protection or in the viability of the seeds. A still higher dose of gamma BHC (one part of the insecticide for a 1,000 parts of grain), however, did bring about a statistically significant decrease in infestation in the case of wheat seeds. In this case, with the recommended dose the infestation went down to about two per cent from 11·53 to 13·15 per cent. As regards viability, it was impaired only in the case of mustard treated with DDT in which case the viability in the treated grain was 91·5 per cent against 95 per cent in the untreated grain.

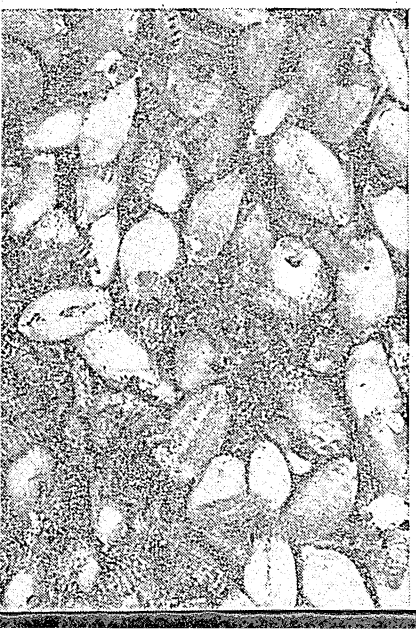
In another series of experiments, four different seeds, viz., wheat *NP 718*, gram *NP 58*, barley *NP 13* and peas *NP 29* were treated with a much higher dose of ten per cent DDT, 15 per cent DDT, 0·5 per cent gamma BHC, 0·5 per cent dieldrin and 0·2 per cent pyrethrins (used singly and also in combination with one per cent piperonyl butoxide), all the insecticides being used at the rate of one part per 250 parts of seed-grains by weight. These experiments carried out at Delhi showed that the insecticides used at the increased doses gave a complete protection against all storage insects for seven months from August to March. Also, viability was not adversely affected due to these high doses of insecticides.

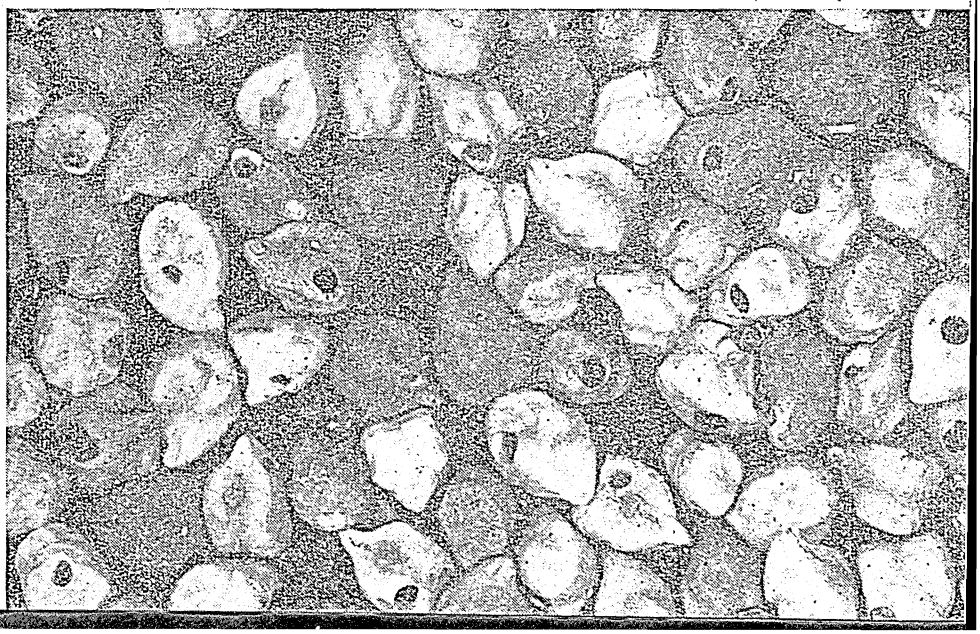


Maize may also meet the same fate at their hands

Thus, these investigations have shown that the problem of keeping at least wheat seed free from infestation can be taken to have been practically solved. Wheat seed uniformly mixed with ten per cent DDT, 0·5 per cent gamma BHC, 0·5 per cent dieldrin or 0·2 per cent pyrethrins at the rate of one part of insecticide per 1,000 parts of grain by weight affords a high degree of protection against the majority of pests except *Trogoderma* larvae. Protection against *Trogoderma* can also be ensured with a fair degree of certainty if the

No less destructive is the pulse beetle to gram





dose of the insecticides is increased to four parts to a 1,000 parts.

Alternatively, the wheat seed can be disinfested by fumigation with a mixture of ethylene dichloride and carbon tetrachloride as and when necessary, for protection against any kind of insect damage. Even a dosage of a 100 pounds of the fumigant per 1,000 maunds of grain for 24 hours exposure, ten repeated fumigations at fortnightly intervals with 40 pounds per 1,000 maunds for 24 hours, and as long an exposure as seven days with the recommended dose of 40 pounds per 1,000 maunds have been found to be safe from the point of view of viability of the wheat seed.

During the period of these investigations, peas, gram and barley seeds have generally been found not to be damaged much during the first year of storage. All the same, it is well known that sometimes these grains are also completely destroyed and sometimes even *Trogoderma* infestation becomes serious. To ensure safety against such infestation, the same treatments as mentioned above for wheat can be confidently depended upon.

As regards other grains, viz., lentil, linseed, *urid*, *rahar*, cowpeas and maize, these insecticidal dusts at the rate of one part per 1,000 parts by weight have been found to give significant protection as compared with grain receiving no chemical treatment, but the degree of protection is not really satisfactory. Also, the viability of linseed is liable to be impaired by the DDT treatment.

Lastly, it may be stressed that disappointment would be in store for you if you keep the treated seeds in a highly infested godown where untreated lots act as constant breeding grounds and whence hardy species like *khapra* (*Trogoderma*) grubs can invade even treated grains although they cannot breed in them.

THE MADURAI COMPOST YARD

(*Continued from page 15*)

crops like *ragi*, brinjals, *agathi*, *solam*, etc., introduced as under.

	Area	
	Acres	*Gunthas*
Guinea grass	144	—
Brinjals and other vegetables	15	10
Plantains	6	30
Edible *Sesbania*	2	20
Rotational crops	40	20
Total	179	

The crop-yields on the farm are quite satisfactory. The grass gives an average yield of about 70 tons per acre per year and fetches good revenue, varying from Rs. 1,600 to 1,800 per acre. The success of this farm will be seen from the following returns.

Year	*Receipts* Rs.	*Expenditure* Rs.
1954-55	1,86,200	76,137
1955-56	1,98,636	78,739
1956-57	2,21,399	85,090

Tilapia fingerlings are maintained in fish ponds started on the farm and the fish thrive in them. The composition of the effluent in which the fish are kept is:

	Sewage	*Effluent*
	Parts per 100,000	
Total solids	214	172
Suspended solids	78.0	3.0
Ammoniacal nitrogen	4.5	0.03
Albuminoid nitrogen	2.8	0.03
Oxygen absorbed	5.625	0.45
Physical appearance	Blackish	Whitish

It is now proposed to double the size of the fish ponds.

On the outskirts of the farm, green manure plants such as *Gliricidia* are grown, and green leaf is sold to paddy field owners. Coconut palms are planted along the roads and outskirts. Tamarind trees are also planted in the rocky highlands.

As the sewage utilized on the southern sewage farm is three million gallons per day of the four million gallons at present available, and as sewerage on the northern bank of the Vaigai river is complete, site for a new sewage farm has been recently selected near Sakhimangalam, a village about four miles from the town. The total area of the new farm is about 250 acres. This new farm is also expected to be developed by the Municipality in the next two years.

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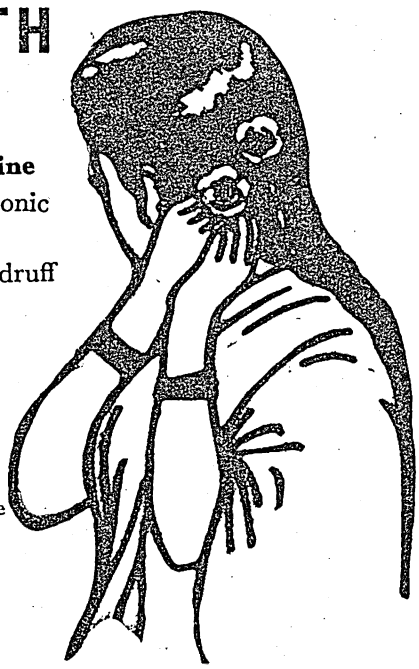
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Those who trade for others, carry on farming through messages, keep their hoard with someone else and marry their daughters without seeing the bridegrooms, repent in the end.

* * * * *

A land without the landlord on the spot spells ruin.

* * * * *

One's own bullocks, one's own labour, one's own wife to cook one's food, one's own children to keep one company preclude any doubt about success in farming.

* * * * *

An absentee's estate enriches the servant while it just keeps the master going.

* * * * *

No house without the mistress of the house ; no farm without a well.

* * * * *

The farmer will flourish in proportion to his care in cultivation.

* * * * *

If a farmer is tired of his work, he will get nothing from his field.

* * * * *

Many are dependent upon the farmer for their livelihood, but he on none.

* * * * *

Culture, manure and weather together produce a full crop.

* * * * *

To cultivate in two villages and to marry two wives will lead to ruin.

* * * * *

A crop is lost for want of looking after, a horse for want of riding and a debt for want of asking.

* * * * *

A thick crop looks well and a thin one yields well.

* * * * *

A wife not loved by her husband and a crop on an unploughed land are both useless.

* * * * *

If the soil be ploughed to the consistency of butter, the yield will be mountain high.

* * * * *

Better plough six times in a hundred days than a hundred times in six days.

* * * * *

Plough for depth rather than breadth.

* * * * *

If the soil be allowed to dry after ploughing, the yield of grain will be doubled.

* * * * *

One who weeds thoroughly gains a treasure.

What Farmers Still Say

About Farming

by

G. R. Koppikar

The husband of an unruly wife and a farmer who cultivates a field full of *hariali* will be ruined.

* * * * *

A field without manure is like a cow without calf.

* * * * *

Worshipping God and manuring the field will not be without reward.

* * * * *

As the rubbish heap rises, the prosperity of the cultivator goes up.

* * * * *

Crops without water are like hair without oil.

* * * * *

Take care of your well and the well will take care of your stomach.

* * * * *

Even one germ of the smut disease in a hundred maunds of *jowar* seeds will ruin the crop.

* * * * *

One should buy a milch buffalo after milking and a bullock after yoking to a cart.

* * * * *

One who manures one's land with bonedust is an expert in practical farming.

* * * * *

Wretched is the cultivator whose land has received no cattle dung as manure.

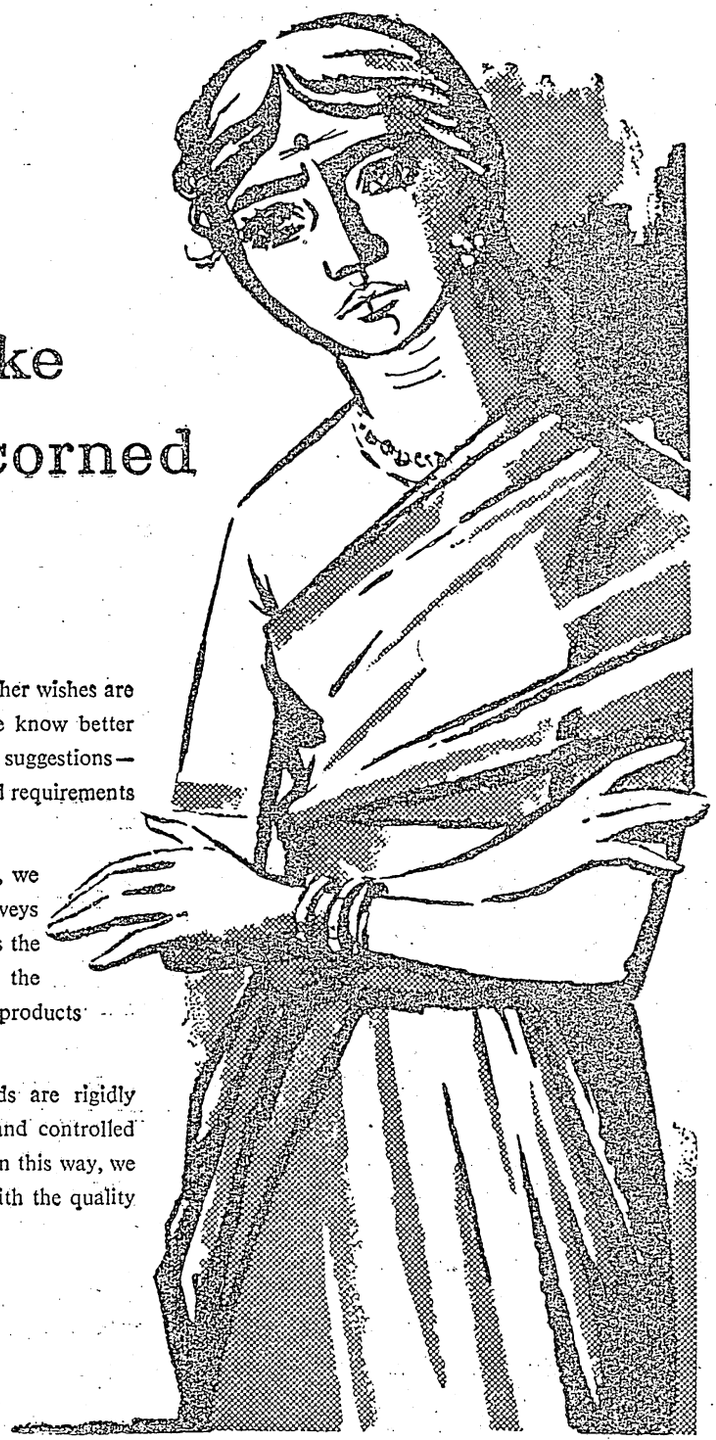
* * * * *

The quality of the bread is determined by the flour, that of animals by the fodder and of the crop by the manure.

* * * * *

Do not let the rain water flow away. Let it be soaked into the land and see what a fine yield you have.

...no fury like a woman scorned



Just a simple housewife.... yet her wishes are of prime importance to us. We know better than to scorn her opinions, ideas, suggestions — for she knows best the needs and requirements of the home.

To find out *just what she wants*, we carry out marketing research surveys all over the country. Thus, it is the housewife who sets many of the standards that Hindustan Lever products must measure up to.

To ensure that these standards are rigidly maintained, quality is checked and controlled at every stage of manufacture. In this way, we are able to supply your home with the quality products that you need.

HINDUSTAN LEVER SERVES THE HOME

HLL 15-X52

WHY PARATHION IS POPULAR WITH MADRAS FARMERS

by

Nagaraja Rao, K.R.

Entomological Division

Agricultural Research Institute, Coimbatore

IF Parathion is getting popular with Madras farmers, there is good reason for this: it promises to end their crop pest troubles.

Parathion (Diethyl paranitrophenyl-thiophosphate) has high insecticidal properties, and when used in the form of an emulsion containing 46·6 per cent of the active ingredient has been found to give a very effective control of the *lablab* aphid, the castor mite, the cotton jassid, the *Gliricidia* mealy bug, the black scale cotton and the *agathi* weevil. Crops treated with Parathion present a better vegetative growth and yield well.

In the experiments, the chemical was sprayed at a concentration of an ounce of the chemical in 12½ gallons of water. Three treatments given at specific periods of crop growth, so as to coincide with the seasons of mass activity of the stem borer moths, proved very effective in the case of the paddy stem borer.

Besides its toxic effects on insects, the additional advantage of Parathion is that it leaves a certain amount of residual effect, and so prevents reinfestation for at least two to three weeks. Thus, it saves the trouble of too frequent applications against pests which appear in definite waves.

Parathion does not taint or kill the plants if it is used in the concentration indicated above. There is no secondary incidence of aphids and mites either, which is common in the case of treatment with DDT and BHC as a result of extermination of parasites and predators of crop pests. If seedlings are dipped in the insecticidal solution prior to planting, there is no danger of insect incidence for at least three weeks.

Particular pests against which Parathion is in use are given in the table on the next page.

Parathion is a poisonous chemical, highly toxic to man and animal. The pesticide will, therefore, have to be kept away from articles intended for consumption, and used after taking due precautions.

Actual contact, either with the concentrated formulation or with the spray fluid, and prolonged exposure of individual users during field application have to be avoided to the utmost extent possible. Workers should not chew tobacco or eat anything while they are engaged in the spraying work..

The equipment used in spraying should be cleaned immediately after the work is over, and the workers should thoroughly wash their hands and face.

The treatment should invariably be stopped three weeks before harvest. The harvested produce in the case of fruits and vegetables should be thoroughly washed in water before passing it on to the consumer.

NEW COTTONS

(*Continued from page 7*)

Bhoj cottons, respectively, were found to give high yields when sprayed with the hormone a-naphthalene acetic acid. The increase in yield was of the order of about a 100 pounds of *kapas* per acre while the cost of spraying worked out to only three to four rupees per acre.

After these encouraging results, similar trials were undertaken in other states. The results of experiments conducted in Uttar Pradesh in 1957 are now available. The trials consisted in spraying a-naphthalene acetic acid (Planofix) in two doses of five and ten parts per million applied at two different stages, viz., at bud formation and at flowering. The varieties used were the *Punjab American 216F* at Raya and the *desi 35/1* at Muzaffarnagar and Meerut.

It was found that spraying of the hormone at five parts per million at the bud formation stage gave higher yields compared to the control at all the three centres. The increases ranged from 52 pounds per acre for *216F* cotton at Raya, and 94 pounds and 102 pounds for *35 1* at Muzaffarnagar and Meerut, respectively.

FOOT ROT OF RICE

(*Continued from page 18*)

deterioration in the vigour of the rice plants, which become predisposed, not only to the Foot Rot disease but also to the Stem Rot and the *Pan Sukh* or Dry Leaf diseases. In ill-drained soils, measures must be adopted to drain off excess water.

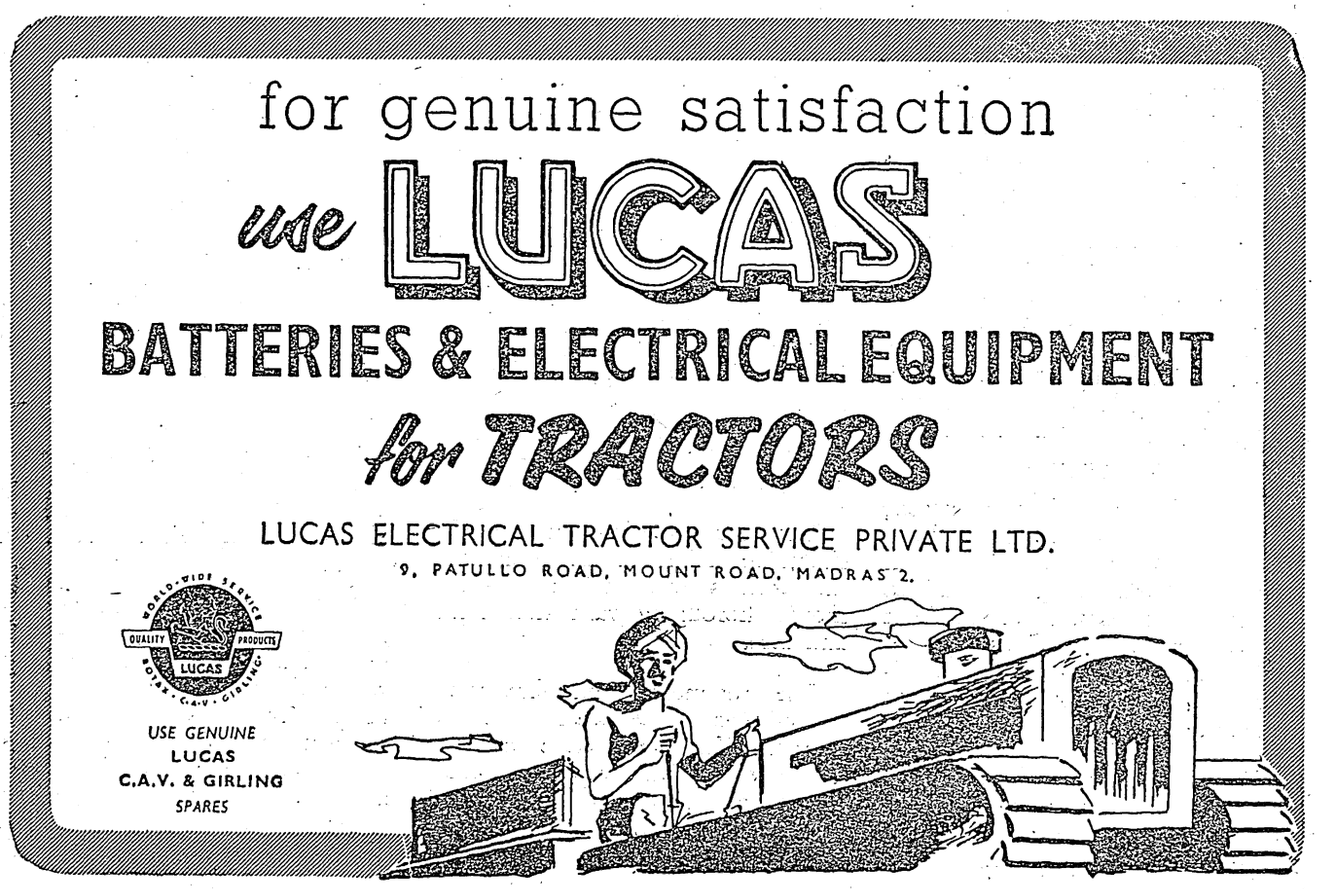
The rice variety *41 Mushkan* has been found to be highly resistant to Foot Rot. This variety may be cultivated where the disease is very serious.

Vigorous plants withstand the attack of the disease remarkably well. The crop should be invigorated by balanced fertilization including the three essential elements—nitrogen, phosphorus and potash. A fertilizer mixture of three parts of sulphate of ammonia, three parts of superphosphate and one part of sulphate of potash is recommended.

Crop	*Pest*	*Dilution recommended for adoption*	*The stage at which the chemical has to be applied*	*Remarks*
Cotton	The spotted bollworms (Earias spp.)	An ounce in 12 gallons of water	Three rounds commencing at the sixth week stage of the crop and repeated thereafter at tri-weekly intervals	This treatment controls, at the same time, the jassid *Empoasca devastens* D, the aphid *Aphis gossypi* G and the thrips *Thrips tabaci* L
Paddy	The paddy stem borer (*Schoenobius incertellus* W)	do.	Three rounds, the first at the nursery stage—a week prior to lifting of seedlings—the second, 20 days after planting, and the third at the shot blade stage of the crop	This treatment controls, at the same time, the paddy jassid *Nephottix bipunctatus* F, the fulgorid *Nilaparvata lugens* S and the thrips *Thrips oryzae* W, and a few other external feeders like grasshoppers, beetle pests, etc.
Tobacco	The tobacco aphid *Myzus mersicae* S	An ounce in 20 gallons of water	The treatment should be given as soon as the initial infestation is noticed. There may be a need for giving two rounds at intervals of about 15 to 20 days	do.
Miscellaneous crops	Jassids, aphids and thrips	do.	The treatment should be given as soon as an initial infestation is noticed	—
	Mealy bugs and scales, hairy caterpillar pests and beetle pests which are external feeders	An ounce in six to 12 gallons of water	do.	—

Dosage: (1) Sixty to 70 gallons of the spray fluid per acre to be used in the case of ordinary pressure sprayers

(2) Two to three gallons of the spray fluid for a medium-sized tree



Newer Techniques for Saving Crops from Pests and Diseases

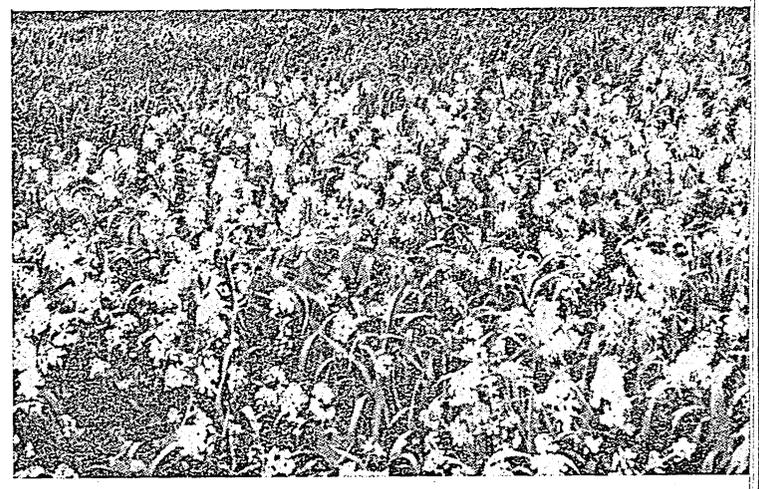
by
G. C. Procter

FROM the earliest times it has been realized that whenever man cultivates the soil his crops are reduced by pests and diseases and by the competition from weeds for light, air and water. Virgil, in his poetical treatise on Italian farming, refers to primitive seed-dressings and to the wild oat problem. It is only in comparatively recent times, however, that the problem of crop protection has been recognized as an international one and that attempts have been made to estimate the effect of the losses.

Where figures are reliably calculated, the results are staggering. For example, it is stated that something approaching 7,000 different species of insects attack crops at some stage somewhere in the world. In the United States, where much time has been spent in studying the problem, it has ben calculated that the boll weevil and other insects reduce the yield of cotton by nearly 15 per cent. The value of the loss of this crop alone is 334 million dollars a year.

The figures for the losses from weed competition are astronomical. The U.S. Department of Agriculture estimates that on fifty-eight crops it reaches a total of 1,700 million dollars.

To take examples from the British Commonwealth: 27 per cent of the maize crop in South Africa goes to feed insect pests; the loss of cereals in Australia due to disease alone is worth £27 million sterling a year. In Great Britain, where agriculture may be said to be highly developed, the total losses amount to something like ten per cent. The average throughout the world is probably nearer to 20 per cent.



The oats plot in the background was treated with "Agroxone" 4 for the control of charlock, the one in the foreground was not

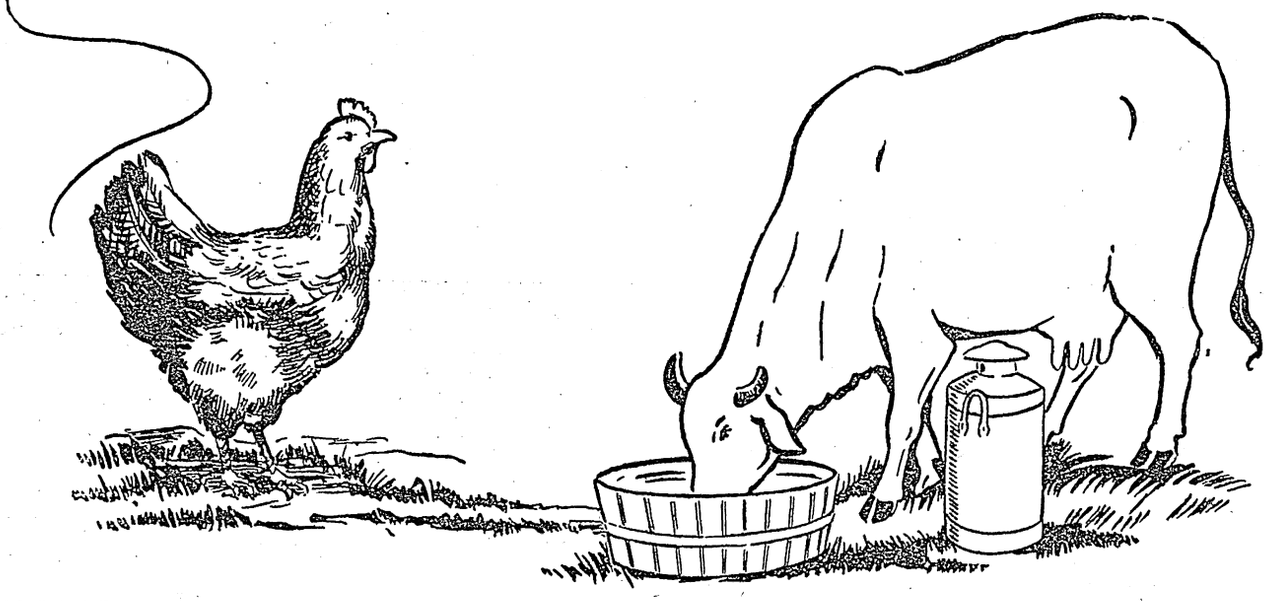
INTERNATIONAL ACTION

Probably the first clear action leading to inter-government collaboration for plant protection was the signing of the Phylloxera Convention in Europe in 1881. Some twenty years previously, the vine phylloxera had been introduced from stock imported from the U.S.A. and had become widely distributed in Central Europe and as far east as the Black Sea. Much thought was given to preventing the spread of this and other pests of the grape by quarantine regulations, and the proposals reached a final and official status in the Phylloxera Convention.

More recently, an international meeting held under the auspices of the International Institute of Agriculture in 1929 adopted a draft "Convention Internationale pour la Protection des Vegetaux." This was signed by twenty-six countries and remained in force until 1951.

Today, international action in the crop protection field is in the hands of the Food and Agriculture Organisation of the United Nations. A number of regional agreements have been signed and technical advice and service has been provided in a number of cases. One of the best examples is the Desert Locust Control which operates anti-locust measures in those

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countries throughout Africa and the Middle East which are not easily able to organize their own measures.

Scientific organizations and individual experts are generally anxious to pool the benefit of their experience. The success of such meetings as the Plant Protection International Conference, attended in 1956 at Fernhurst by representatives from forty-two countries, is a measure of this desire for world-wide action.

Let us now consider some of the new developments in the crop protection science. One should say definitely at the outset that chemical treatments are an adjunct to good husbandry. The first essential in raising the level of production is to make the fullest use of improved cultural methods and fertilizers to obtain a potentially healthy plant. Much also has been and is being done to produce disease-resistant varieties of many plants, but this ideal is very far from being reached. In the meantime, chemical preventive measures are essential in many cases. We will consider these measures under two main headings: first, the chemicals used and second, the means of applying them.

CHEMICALS USED

The chemicals used for crop protection purposes may be divided into three groups: insecticides, fungicides and weed-killers.

Before the 1939-45 War, we had relatively few and relatively simple chemicals to cope with the problems. Among the insecticides, we had the natural plant products—nicotine from tobacco, rotenone from derris and pyrethrum powders and extracts—to use as contact insecticides; that is, chemicals which kill when the insects and eggs come in contact with them either directly or after application to the host plants. Tar oil and petroleum washes were and still are used as contact insecticides. Petroleum oil emulsions used against citrus scale insects are also contact insecticides.

As stomach insecticides we had lead, calcium and other arsenates, Paris green, the silicofluorides and, in some of its applications, derris. These products were sprayed or dusted on to the host plant and were ingested with the insects' natural food. Poison baits for killing locusts or cutworms are a special case for the use of stomach insecticides.

Finally, we had fumigants such as hydrogen cyanide and tetrachlorethane. We had no practical systemic insecticides at that time.

Before 1939, we had relatively only a few fungicide chemicals. They were mainly preparations of sulphur and copper for spraying and dusting and, as fungicidal seed-dressings, the organo-mercurial products.

Weed-killers too were not very extensively developed. The chlorates, arsenicals, borates and coaltar products were available as "total" weed-killers. The "selective" weed-killers were few and, apart from sulphuric acid and dinitro-orthocresol (DNC) which are unpleasant and dangerous to handle, they were not used very extensively.

SYNTHETIC INSECTICIDES

The era of the modern synthetic insecticides really began with the discovery in Switzerland, early in the 1939-45 War, of DDT, which is both a stomach and a contact insecticide and a safe, efficient chemical, effective against a wide range of pests including flies, caterpillars, capsids and some species of aphids.

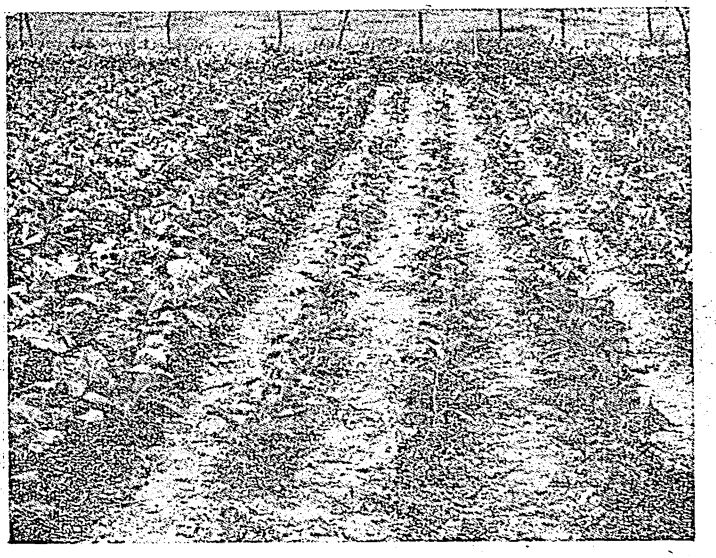
There followed almost simultaneously in France and in England the discovery of the insecticidal properties of BHC, which kills much the same range of insects as DDT, with one very important addition, wireworm. BHC was the first economic chemical to be used effectively against this pest. It is generally a better aphid killer than DDT.

BHC has a disadvantage in that it taints certain susceptible crops such as potatoes, but with the purified gamma BHC or lindane, the risk of taint is much reduced. It is sometimes erroneously stated that gamma BHC does not cause taint; the facts are as follows. Crude BHC is a mixture of several isomers which are all capable of causing taint. The highly insecticidal part, however, is the gamma isomer, which forms only about 13 per cent of crude BHC. Therefore, when gamma BHC is used, much less chemical is needed to kill the pest and to this extent it is less likely to cause taint.

To the DDT, BHC range of chemicals have now been added such chemicals as aldrin, dieldrin and endrin, discovered in the U.S.A. All of them are complex chlorinated compounds. It is not yet known to what extent they will eventually supplant DDT and BHC. Aldrin and dieldrin are both wireworm killers, though less efficient than BHC. The risk of taint is less, and dieldrin in particular is very persistent. Both are relatively more toxic than DDT or BHC, concentrated aldrin especially being easily absorbed through the skin.

The main limitation of all these chemicals is that they do not kill red spider, which is one of the main

Dressing the seed with "Gammasan" against an attack of the flea beetle has given a very good stand of the crop (*left*) than sowing untreated seed (*right*)



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pests of fruit. Therein lies one of the chief advantages of the phosphorous insecticide Parathion discovered by Schrader in Germany during the 1939-45 War. In the course of this work, Schrader also discovered a range, of phosphorous insecticides having a systemic action, and the first of these to be marketed is known by the coined name Schradan.

Systemic insecticides are absorbed by the cell sap and carried about the plant so that complete coverage with spray is not so essential as with a non-systemic to render the plant toxic to the insects. They may be applied as sprays or even to the roots as watering treatments. Systemics are effective mainly against aphids and red spider which suck the plant sap.

The disadvantage of all phosphorous insecticides is that they are highly poisonous to human beings, and protective clothing must generally be worn when applying them. However, with a recently introduced systemic, Metasystox (demeton-methyl) protective clothing is required only when mixing the concentrate.

As non-poisonous spider-killers we now have chlorinated compounds such as CPCBS (chlorfenson) which act mainly as ovicides.

FUNGICIDES

Many of the newer fungicides are organic forms of sulphur. These are generally less likely to damage the plant than are the inorganic forms such as lime sulphur. Examples are thiram, zineb, ziram and ferbam. Another fungicide recently introduced into this country is captan and this has found particular uses against apple scab, and as seed-dressings.

SELECTIVE WEED-KILLERS

Perhaps the most spectacular modern development has been the use of the growth-regulating or hormone-type selective weed-killers. Two of these, MCPA and 2, 4-D, have become common names with the farming community. Before the 1939-45 War, weed-killing in cereal land was a hazardous business; today, it is so safe and inexpensive that about one-third of Britain's cereal acreage is sprayed every year.

Two additions to this range are now in general use. 2, 4, 5-T for use on woody plants such as brambles and brushwood; MCPB is rather safer than MCPA on pastures containing young white clovers.

The most recent advance in this field is the discovery of CMPP, a cereal weed-killer for control of chickweed and cleavers—important weeds which are resistant to MCPA and 2, 4-D.

One of the biggest needs is for safe and reliable weed-killers in vegetable crops where the hormones cannot be used.

SEED-DRESSING

Many means have been devised for applying crop protection chemicals but, apart from baiting, which

has rather specific uses, they may be considered under three main headings: spraying, dusting and seed treatment.

Seed treatment, or seed-dressing as it is usually called in England, will be considered first, since it is the simplest and the least expensive of all crop protection methods.

One of the most widespread diseases of cereals is bunt of wheat. In olden times, to grow wheat was to have bunt; today, serious attacks occur only where the seed is not treated with chemicals to kill the spores of the fungus. The main chemicals used against bunt and other seed-borne diseases of cereals are the organo-mercurials, and their use has been a standard practice in this country since the early 1930's. The organo-mercurials also protect against soil-borne fungi which attack the seedlings, particularly in cold, wet seasons.

The most important post-war seed-dressing development has been the addition of insecticides to give protection against wireworm as well as disease. The layman is surprised by the small quantity of chemicals used in seed-dressings. A little more than an ounce of gamma BHC protects an acre of wheat against attack by half a million wireworms; 1/20 of this quantity of organo-mercury protects against disease. The quantity of gamma BHC used in a cereal seed-dressing is so small that it is well below the level at which it can taint a following susceptible crop such as potatoes.

Concurrently with the development of insecticidal dressings for cereals, seed-dressings were developed for other crops. On vegetables, for example, organic fungicides such as thiram are preferred to organo-mercurials since they are somewhat safer on small seeds and give better results against soil-borne diseases which are generally the more important ones on these crops.

Almost every seed sown will benefit from some form of seed treatment. In Great Britain, almost all seed-dressings are applied as dusts. Overseas, there is an increasing use of liquid dressings to avoid the dust hazard of powder dressings.

SPRAYING AND DUSTING

When the hormone weed-killers were first introduced, they were marketed as dusts to be applied by a fertilizer distributor. In a country such as the U.K., where water is readily available, spraying is obviously preferable since it gives a better distribution of the chemicals, and the cost and carriage of the inert filler in a dust is saved.

Ten years ago, few individual farmers possessed spraying machines, and those in existence were able to apply the chemical only in volumes of a 100 gallons or more of water per acre. However, by using smaller jets it was found possible to apply selective weed-killers in volumes of water as low as five gallons per acre. Today, many thousands of low-volume farm sprayers are in use throughout the country. In the low-volume ground sprayer, the spray falls from the boom by gravity; when spraying into trees or bushes, some means must be found for carrying the spray upwards. This is achieved by means of a powerful blast of air and all low-volume fruit spraying is carried out by air-blast machines.

Low-volume techniques are now being developed for almost all crops. For example, the aerosol system of applying insecticides in glasshouses is really an extreme form of low-volume spraying.

With the development of low-volume spraying, dusts have been less widely used in this country. Overseas, however, particularly in countries where water is not readily available, dusting is still used. Recent machinery developments include small, portable power dusters which can be carried by one man in a country where it is not possible to use heavy-wheeled equipment.

FUTURE TRENDS

Although we now have many new chemicals, they all have their limitations and we are still handicapped by the lack of fundamental knowledge as to exactly how they work. This fundamental knowledge is essential if we are to prepare new materials by design rather than discover them by accident or by trial and error, as has so often happened in the past. In this work, the chemist, the physicist, the biologist and the engineer must each play his part.

For example, for many years, apple scab has been prevented by spraying with sulphur preparations, which give good protection but are liable to damage sensitive varieties. Recently, a new fungicide, captan, was introduced. It gives better protection than sulphur against the disease, causes less damage and results in higher yields of better quality fruit. Unfortunately, captan has little effect on another disease, apple mildew. Mildew is reasonably well controlled by sulphur sprays, but where captan has been used heavy attacks have frequently developed. A number of solutions to the problem have been suggested, but they are all compromises. We need a new fungicide with the efficiency and safety of captan against scab, together with protection against apple mildew.

Similar examples can be quoted in almost every aspect of crop protection, which is a very young science. Everywhere, from laboratory to field, it is necessary to increase the tempo and volume of research.

NEWER CHEMICALS

Given below are the names of the newer crop protection chemicals as recommended by the British Standards Institution.

Recommended common name	*Chemical name*
DDT	Dichlorodiphenyltrichlorethane (technical DDT is a complex mixture in which *pp'*-DDT predominates)
	pp' - DDT = 1 : 1 : 1-trichloro-2 : 2-di-(*p*-chloropheny)ethane
BHC	Benzenehexachloride mixed isomers of 1 :2 :3 :4 :5 :6-hexachlorocyclohexane

'UDOLAC'/PENICILLIN

Every cow owner knows that mastitis means loss of milk, and sometimes also the loss of one or more quarters of the udder. Mastitis is easy to see when it is acute, but by then it is often too late to cure.

Mastitis Detection Cards

These can now be bought in envelopes with directions for use for 4 annas. Each envelope contains 10 cards, and each card is enough for two tests. If the milk in the udder is infected the card changes colour, and you should treat the udder immediately.

'Udolac' / Penicillin Cream

This cream has the widest action against all forms of mastitis. It is packed in special tubes that make it easy to inject the cream into the udder.

Ask your Veterinary Doctor

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ICV-442

Aldrin	1 :2 :3 :4 :10 :10-hexachloro-1 :4 :4a :5 :8 :8a-hexahydro-exo-1 :4-endo-5 : 8-dimethanonaphthalene
Dieldrin	1 :2 :3 :4 :10-hexachloro-6 :7-epoxy-1 :4 :4a :5 :6 :7 :8 :8a-octohydro-exo-1 :4-endo-5 :8-dimethanonaphthalene
Endrin	A stereoisomer of dieldrin
Parathion	diethyl *p*-nitrophenyl phosphorothionate
Schradan	bis-NNN'N'-tetramethylphosphorodiamidic anhydride
Chlorfenson (CPCBS)	*p*-chlorophenyl *p*-chlorobenzene sulphonate
Thiram	bis (dimethylthiocarbamoyl)disulphide
Zineb	zinc ethylene-1 :2-bisdithiocarbamate
Ziram	zinc dimethyldithiocarbamate
Ferbam	ferric dimethyldithiocarbamate
Captan	N-trichloromethylthiocyclohex-4-ene-1 : 2-dicarboxyimide
Metasystox (demeton-methyl)	A mixture of demeton-0-methyl and demeton-S-methyl demeton-0-methyl=2-ethylthioethyl dimethyl phosp horothionate demeton-S-methy=S-2-ethylthio-ethyl dimethyl phosphorothionate
MCPA	4-chloro-2-methylphenoxyacetic acid
2, 4-D	2 :4-dichlorophenoxyacetic acid
2,4,5-T	2 :4 :5-trichlorophenoxyacetic acid
MCPB	γ-(4-chloro-2-methylphenoxy) butyric acid
CMPP	4-chloro-2-methylphenoxypropionic acid

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assures protection of edible plants, ornamental plants and fruits, against the different plant parasites, sensitive to Copper to which they are subject.

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is very useful to farmers, planters, orchardists and vegetable growers because of its superiority in the control of pests. It is one of the safest insecticides.

KARATHANE WD

is an organic fungicide that controls powdery mildews without harming the crop, the blossom or the foliage of fruit trees, vegetables, field crops and ornamentals. It also controls certain mites.

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what's being done to take sugarcane yields higher

by

P.P. Chandra and Chatur Behari
Indian Central Sugarcane Committee
New Delhi

IN SPITE of the introduction and spread of improved varieties of sugarcane with high yields and good sucrose content evolved at Coimbatore, our acre-yield of sugarcane unfortunately continues to be as low as 14 to 15 tons as against 60 to 65 tons in other important cane-producing countries of the world ; similarly, our sugar recovery percentage is about ten compared to 12 to 14 in those countries.

Research has, however, established that if optimum conditions are provided to the sugarcane crop, cane yield in India can compare very favourably with that in any other country.

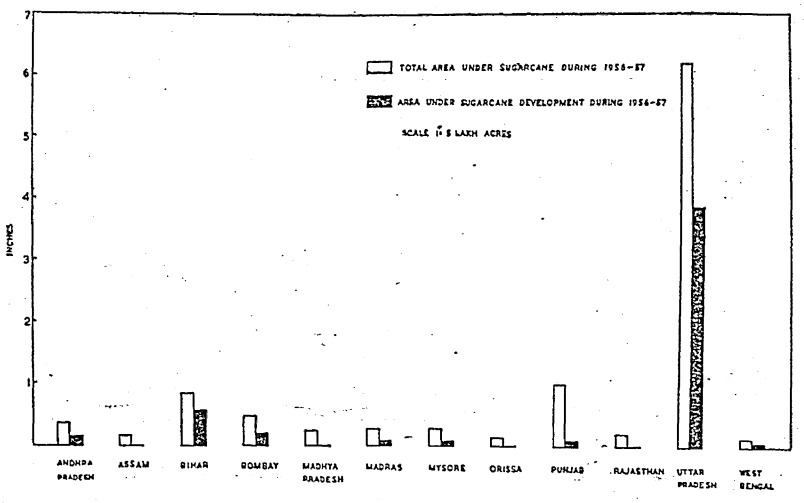
Sugarcane being a heavy feeder requires judicious manuring and irrigation, apart from other improved cultivation practices, to give high yields and good-quality cane. India is a country where soil and climate vary from region to region; so do the requirements of sugarcane.

The area under sugarcane in India can broadly be divided into two belts: (i) the Indo-Gangetic alluvium covering the states of Uttar Pradesh, Bihar, West Bengal ; (ii) the peninsular belt with its tropical climate comprising Bombay, Madhya Pradesh, Mysore, Andhra Pradesh, Madras, Kerala, etc. These two belts differ widely in soil and climate. Owing to its mild winter, in the peninsular India, it is possible to plant sugarcane practically throughout the year, which is not the case in the northern belt.

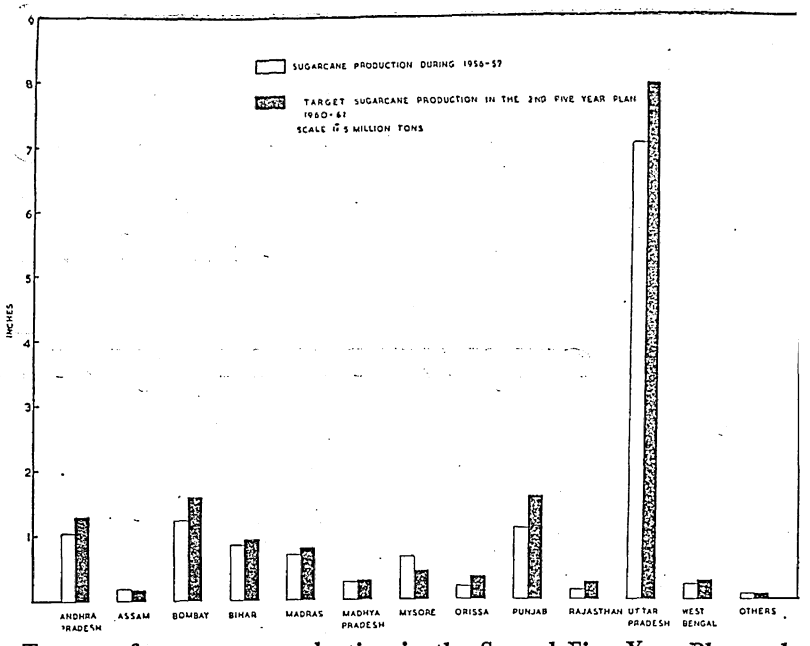
SUGARCANE DEVELOPMENT

Taking into consideration the above factors and the poor resources of Indian cultivators, the Indian Central Sugarcane Committee in collaboration with the State Governments launched five-year Sugarcane Development Schemes in 1948-49 with the twin objective of obtaining high sugarcane yields and good-quality cane; the Schemes were later extended to co-terminate with the First Five Year Plan in 1955-56. The Schemes envisaged (i) provision of adequate irrigation facilities, (ii) supply of adequate quantities of manures and fertilizers of the right type, (iii) seed-nurseries for the supply of pure and disease-free seed, (iv) control of pests and diseases, (v) use of improved implements and a better system of cropping and (vi) efficient Soil Extension Service, etc.

Sugarcane acreage in various states and the area under development



During the First Five Year Plan, an area of about eight lakh acres was taken up under the intensive sugarcane development programme, but it was observed that while the yields in the Development Zones showed an increase, this was counter-balanced by the low yields in the non-developed areas. In view of this, the entire cane acreage in the country is intended to be covered under the Sugarcane Development Scheme during the Second Five Year Plan.



Targets of sugarcane production in the Second Five Year Plan and the actual production achieved during 1956-57

TARGETS AND ACHIEVEMENTS

During the First Five Year Plan, the work of surgarcane development covered only the factory areas with production targets of 631 lakh tons of sugarcane and 18 lakh tons of sugar ; the actual achievements were 580 lakh tons and 18.5 lakh tons, respectively. Taking into consideration the above achievements and the requirements of sugar during the next five years, a production target of 22.5 lakh tons of sugar has been fixed for the Second Five Year Plan, keeping in view the following factors.

(a) A 6.5 per cent rise in population by the end of the Second Five Year Plan.

(b) A 25 per cent rise in the national income and an 18 per cent rise in the per capita income during the Second Plan period.

(c) The per capita (adult) consumption of sugar as 1.47 ounces as against the optimum standard of two ounces.

(d) The tendency of people to shift to white sugar in preference to brown sugar (*gur khandsari*).

In order to achieve the sugar production target of 22.5 lakh tons and also to increase the production of *gur khandsari*, a target of 780 lakh tons of sugarcane production has been fixed to be achieved at the completion of the Second Five Year Plan.

During 1956-57, the first year of the Second Five Year Plan, a total production of 669 lakh tons of sugarcane and 20.29 lakh tons of sugar has already been achieved.

The statement on the left shows the statewise break-up of targets and achievements of sugarcane production.

The Sugarcane Development Schemes initiated by the Indian Central Sugarcane Committee in 1948-49 in the various states have given encouraging results in the Development Zones. The Sugarcane Development Zones are now widening and with the entire sugarcane areas coming under development, as proposed under the Second Five Year Plan, it is expected that the improvements in the All-India acre-yields would fully reflect the progress of sugarcane cultivation in India.

Further efforts to improve the acre-yields through an Intensive Manuring Campaign, All-India Sugarcane Crop Competitions and road development are in progress.

State	*Cane production in 1956-57 (lakh tons)*	*Target Sugarcane production in the Second Five Year Plan: 1960-61 (lakh tons)*
Andhra Pradesh	51	40+21 for the former Hyderabad
Assam	7	7
Bihar	41	45
Bombay	60	77
Madras	34	39
Madhya Pradesh	13	13
Mysore	31	21
Orissa	9	17
Punjab	54	78
Rajasthan	6	11
Uttar Pradesh	348	393
West Bengal	11	14
Others	4	4
Total	669	780

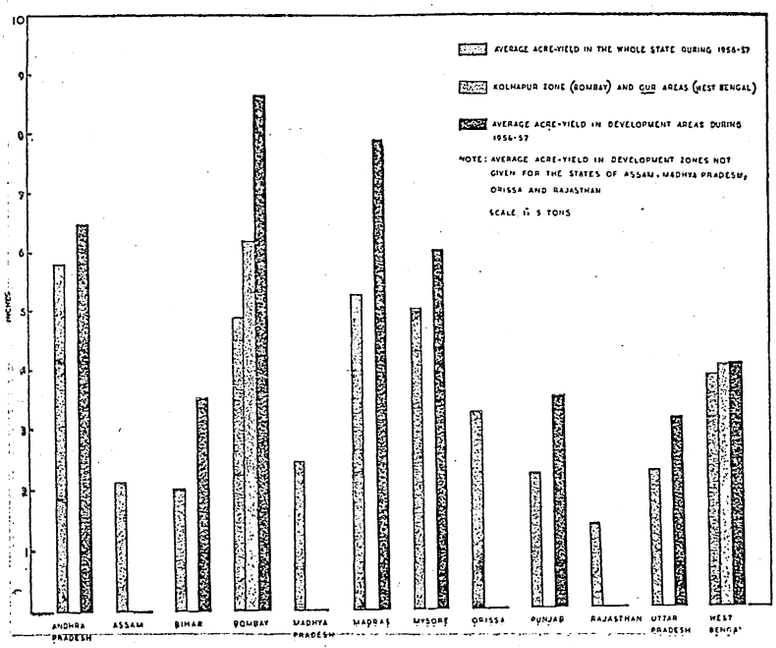
State	Total area under sugarcane (acres)	Area under Development Zones during 1956-57 (acres)	Average yield per acre during 1956-57 in the State (tons)	Average yield per acre achieved in Development Areas during 1956-57 (tons)
Northern States				
Punjab	4,87,000	35,146	11.1	17.7
Uttar Pradesh	30,50,000	19,07,000	11.4	15.92
Bihar	4,05,000	2,67,000	10.1	17.6
West Bengal	57,000	11,255	19.5	20.47 (Factory areas) 18.93 (*Gur* areas)
Assam	63,000	—	10.6	—
Madhya Pradesh	1,06,000	—	12.2	—
Rajasthan	82,000	—	7.0	—
Southern States				
Andhra Pradesh	1,75,000	62,318	29.0	32.49
Bombay	2,24,000	62,000 12,000	24.5	43.3 (The Deccan canal area) 31.0 (The Kolhapur Zone)
Mysore	1,23,000	30,000	25.2	30.0
Madras	1,29,000	45,000	26.4	39.44 (Development area) 20.99 (Non-developed area)
Orissa	56,000	—	16.4	—

Road development is necessary to facilitate transport of cane from the field to the factory to reduce the time lag between the cane harvest and its actual crush. Cane competitions have revealed that high sugarcane yields can be obtained if proper attention is paid to the crop at the various stages of its growth. As against the average acre-yield of 12 to 15 tons in the north and 30 to 40 tons in the south, yields as high as 135 tons in prize plots in Bombay, 129 tons in Madras and 76 tons in Bihar have been obtained.

A statement showing the comparative yields of sugarcane and the sugarcane acreage under the Development areas in the various states is given above.

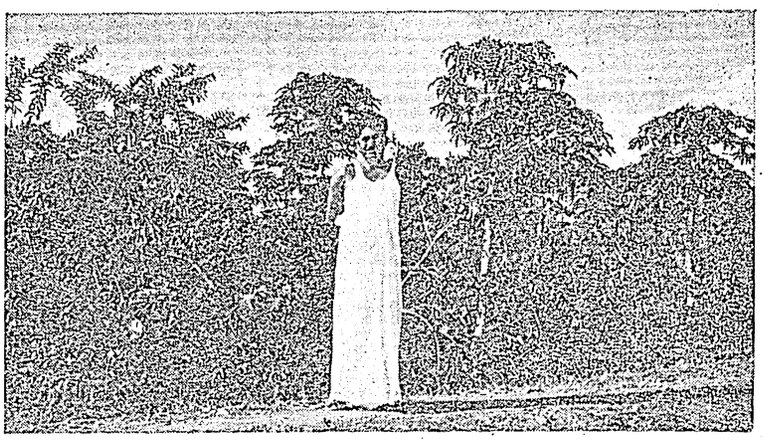
It would appear that the acre-yields obtained in the Development Zones are markedly higher than the state averages. If this improved trend in acre-yield in the development areas is maintained during the remaining period of the Second Five Year Plan, we are likely to achieve our targets fully. This would not only enable us to meet our domestic requirements of sugar but would also place us in a position to export sugar and thereby earn substantial foreign exchange. The present upward trend in sugarcane acreage is, however, to be curbed in favour of an increase in yield from a smaller area which is also the ultimate objective of the sugarcane development programme.

The average per-acre sugarcane yield in the Development Zones and in the states as a whole



Farmers I Have Met

Guavas and Papayas— Paying Partners



Shri Doraiswamy in his orchard

GUAVAS and papayas can be profitable orchard companions; this is the experience of Shri K. Doraiswamy, whom I met recently at his 1¾-acre orchard near Perianaickanpalayam on the road from Coimbatore to Nilgiris.

Doraiswamy's "mixed" garden, as he likes to call it, brings him a yearly per-acre profit of about Rs. 2,250. There are 110 trees of papayas to the acre planted 20 feet apart in rows, with the same number of guavas, also 20 feet apart but planted in between the papaya trees.

Doraiswamy procured grafts of guavas and seeds of papayas. He dug pits three feet × three feet × three feet, and filled them level with the ground with a mixture of green manure, compost, cattle manure and the dug-out earth.

He planted a guava graft in the centre of each pit, sloped the earth from the plant stem to the outer circle of the pit which he deepened into a one-foot channel. In the case of papayas, first, three seeds were sown in each pit and ultimately only one robust seedling retained.

In the second month of planting, each guava plant received one pound of groundnut cake; thereafter, 1¼ pounds of a mixed manure of groundnut cake 50 per cent, bonemeal 20 per cent, fishmeal 20 per cent and ammonium sulphate ten per cent, was given annually in four equal quarterly doses.

No manure was given to papayas after the initial compost and cattle manure. "Manuring, no doubt, increases the size of papayas, but reduces their keeping quality," was the reason given by Doraiswamy. "And, keeping quality is very important in marketing them. Moreover, the Coimbatore and Ooty markets appreciate three to four-pound fruits which can be obtained without manuring," he added.

For irrigation, Doraiswamy has fitted a pumping-set to his 45-foot deep well. Papayas are irrigated once a week and guavas twice a week "for, frequent irrigation increases the size of papaya fruits and ripens them quickly." Therefore, papayas and guavas have separate irrigation channels. The entire orchard is given four *mammutty* diggings in a year to check weeds and conserve soil moisture.

This novel venture of Doraiswamy is becoming the talk of the neighbourhood. Looking to the profits he was receiving and the experience he had gained, I was not surprised when he told me that shortly he would extend the area of his orchard.

—M.J.D.

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the rabi campaign is on

HOW TO RAISE

A Better Barley Crop

Grow a green manure crop before barley

You can grow *lobia*, sannhemp, *dhaincha* or any good green manure crop.

Prepare the field well

Plough the field first with a soil-turning plough. Follow up with a *desi* plough a number of times.

After each ploughing, plank the field. If the moisture in the field is very little, work the *palewa*.

Fertilize the crop well

Fertilize barley with 50 to 150 pounds of ammonium sulphate (20 seers of nitrogen). Half of this may be in the form of cattle manure, compost or oilcake and the other half, chemical fertilizers.

Also apply phosphates. Have the fertilizer well-powdered and mixed with the soil before application.

Sow improved seed

Ask your Gram Sewak what improved variety of barley is recommended for your area.

Good varieties of barley have been evolved in Uttar Pradesh and the Punjab, and at the Indian Agricultural Research Institute, New Delhi.

Treat seed before sowing

With "Agrosan GN" and "Ceresan" (for the Covered Smut and Leaf Stripe diseases).

Sow in time

The best time is the second fortnight of October. A maund of seed will be sufficient for an acre. Sow in lines nine to 12 inches apart.

Irrigate in time

Give the first irrigation a month after sowing, the second at flowering.

REMEMBER,

Do not delay turning in the green manure

Do not allow weeds to grow in the field

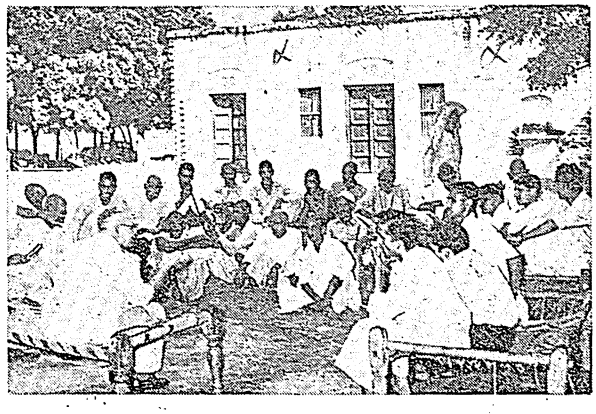
Do not delay sowing beyond November

Do not sow diseased or small seed

Do not harvest before the crop is fully ripe

Do not store the produce in a damp godown

Farmers eagerly listen to the leader of a team of agricultural experts explaining to them better ways of raising *rabi* crops



From Treating Seed to

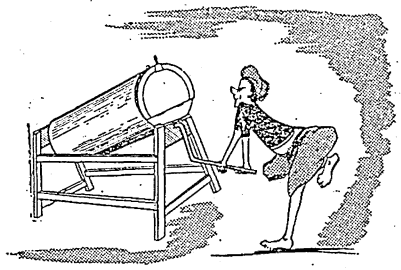
Controlling White Ants

WHEAT and barley seed can be treated against diseases at very little expense.

The wheat crop generally gets such diseases as Bunt, Flag Smut and Foot Rot, and the barley crop, Smut, Stripe and other leaf spot diseases.

For these diseases, the seed should be treated with organo-mercurial compounds like "Agrosan GN" and "Ceresan." Eight *tolas* of the chemical would be needed to treat a maund of the seed.

For treating wheat or barley seed with the chemical, seed-treating drums are being made available by the State Governments and the Plant Protection Organization of the Government of India. Such a drum can treat about 15 maunds of seed in eight hours.



Individual farmers can also use earthen *chatties* or *gharas* or metallic drums with tight lids for the purpose. The containers are to be filled 2/3 with the seed to be treated. After adding the required quantity of the chemical, the lid should be closed and the *chatti* or *ghara* rotated for about three to six minutes to ensure a thorough mixing of the chemical with the seed. If a drum is used, it can be rolled on the ground for proper mixing.

For treating of seeds this way, farmers will need only five annas worth of the chemical per maund of seed.

Farmers are advised that they should treat their seed within about two weeks of sowing time, and store the seed in a dry place after treatment. They should not inhale the chemical or allow its particles to fall on any part of the body. It is safer to treat the seeds in the open than in closed rooms. They should also not use treated seed for consumption or for feeding to their animals.

In Delhi, the Plant Protection Directorate of the Government of India is making available to local farmers a petrol engine-driven seed-dressing machine, which can treat about 800 maunds of seed a day so that the needs of an entire village can be easily met.

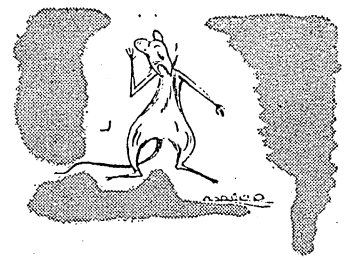
FIELD RAT TROUBLE

FIELD rats cause damage to crops in many areas. Using poison baits is now being widely recommended as a good method of controlling them.

The bait is made with three per cent zinc phosphide (by weight) mixed in 97 per cent (by weight) of a carrier like crushed *jowar*, maize, gram, wheat or barley and a just sufficient quantity of any vegetable oil to make this mixture slightly greasy.

First, the carrier is soaked in water for 15 minutes. Then, it is drained, air-dried and mixed with zinc phosphide. A *chhatak* of any cheap vegetable oil like *sarson*, *til* or groundnut oil for every five seers of the bait is added. The addition of the oil makes the bait attractive to the rats.

The first thing to do is to locate all rat burrows in the fields and close them. Those which are found open on the following day should be baited. An ounce or half a *chhatak* of the bait rolled in paper should be inserted two to three inches inside the burrow. After the bait has been introduced, the burrow should be closed. If found necessary, the burrows should be baited again on the third day.



Rats also destroy stored farm produce and other household articles. Poison baits can be used to control rats in households too.

Since the bait is poisonous to human beings, cattle and poultry, every care should be taken to keep people or cattle or poultry from having access to it in the field or in the home. It is a good precaution to use hand gloves for preparing the bait or handling the same.

Good results would be obtained if the rat control is conducted after sowings as well.

EARCOCKLE IN WHEAT

THE Earcockle disease, prevailing in certain wheat-growing areas, can easily be controlled.

The seed collected from a crop affected by Earcockle will have hard, brown, deformed seeds which are actually Earcockle galls. These galls will have a large number of disease germs inside. Hence, the galls have to be separated from the seed before sowing. To separate the galls from the seed, immerse the wheat seed containing the galls in ordinary water in any container. Stir the seed vigorously. The galls will float on the surface of the water when they can be easily removed and destroyed by burning. Do not allow the wheat seeds to soak in the water for long, as otherwise the gall seeds will also absorb water and sink, and separation will be difficult.

After the galls are removed, drain away the water and dry the seed and keep it in a dry place till sowing.

WHITE ANT TROUBLE

FARMERS can now fight the white ant trouble with easily available chemicals like BHC and aldrin.

White ants are found infesting fields in many areas, especially in the *barani* areas. They feed on seed, seedlings and plants in such fields.

When there is white ant trouble, the fields should be treated with BHC or aldrin. Five pounds of ten per cent BHC or ten pounds of five per cent BHC will be sufficient to treat an acre. If it is aldrin, 25 to 30 pounds of two per cent aldrin or ten pounds of five per cent aldrin are needed to dust an acre. Such a treatment can be taken up with preparatory cultivation or with the sowing operation.

In case the fields cannot be treated before sowing, or if a treated field still has white ants left in it, aldrin emulsion (two pounds in ten gallons of water) should be sprayed over the field and the field hoed to mix the chemical well with the soil.

Farmers are also advised to locate white ant mounds and destroy the white ant colonies, particularly in uncultivated areas round about the fields. These will help in a more permanent control of the pest.

Agricutural Officers or Gram Sewaks of the locality will be able to advise farmers where they would be able to obtain the chemicals needed.

What to do in

OCTOBER

- Complete the sowing of barley
- Sow gram in the third week
- Take up sowing of wheat and *rabi jowar*

NOVEMBER

- Complete the sowing of wheat in the earlier part of the month
- Sowing of *rabi jowar* can continue
- Keep in touch with your local agricultural officers for advice on cultural operations and manuring schedules of *rabi* crops

More About Gram and Wheat

GRAM

Weeding is the most essential operation in gram. The yield is directly proportionate to weeding of the crop. Carry out the first weeding three weeks after germination and the next after another three to four weeks. Intercultivation reduces the labour required and the job is done quickly.

Topping

When the growth is luxuriant and flowering is somewhat getting delayed, topping will help in reducing the size of plants and better setting of pods. Sometimes, sheep and goats are allowed to quickly nibble off a portion of the tops.

WHEAT

Preparatory tillage

Ensure that there are no stubbles of the previous crops and the field has received enough ploughings to keep down weeds to the minimum. The last cultivation should be given one or two days before sowing to kill germinated weeds. The field should have enough moisture and should be without clods when ready for sowing.

Sowing

The optimum period of sowing is the middle of October to the middle of November. If, however, sowings are to be done later, use a higher seed-rate.

Stand of the crop

The seed starts germinating in about six days of sowing. Keep a watch for about a week against crows and other birds damaging the crop.

Where germination is poor, fill up gaps.

Weeding

Most of the weed seeds germinate within a fortnight. Complete weeding by December or the first fortnight of January. This weeding should be between the crop rows. In the second weeding, which may be done 50 days after sowing, remove weeds within the row also.

Irrigation

Prepare beds according to the flow discharge from the source of irrigation. For one cubic foot per second (one cusec) of water flowing through a channel, the ideal bed-size is 1/8 acre or about 75 feet × 75 feet. For a 1/19 cusec discharge, as from a *charsa* or Persian wheel, the most suitable size of the bed is about 20 feet × 20 feet. For any other source of irrigation, adjust the bed-size proportionately, depending upon the flow discharge; the smaller the bed, the more uniform the distribution and the smaller the loss in seepage of water.

Level the soil in the bed perfectly. The bunds of the beds should be fairly strong so as to avoid overflow.

For giving a presoaking dose, plank the field to reduce unnecessary filling of the field and avoiding excessive water use. You will save two acre-inches of water this way. After the presoaking irrigation, the subsequent ones should not exceed two acre-inches each. This will reduce unnecessary seepage losses and enable you to extend your area under irrigation.

Ordinarily, the number of irrigations required after sowing is two from canal supplies and four if the source is a well fitted with a Persian wheel. The variety *N.P. 718* matures early and, therefore, does not require irrigation after the heading of the crop. The critical periods are 40 to 50 days after sowing, when tillering is in progress, and at the time of the heading of the crop.

Clean irrigation channels of weeds and other obstructions. If the channels are silted, dig them properly to allow free passage of water.

community effort will be necessary where culvert's passage has been blocked.

Fertilizer application

To poor lands of a low production potential, apply the fertilizer at the sowing time. To lands of a medium production potential, apply half the quantity at seeding and the other half at first irrigation, i.e., 40 to 50 days after sowing. To lands of a higher fertility, apply phosphate at seeding and the full dose of nitrogen at first irrigation.

Placement of fertilizer increases crop response to it by about eight to ten per cent. The best way to do it is to drill it deep through a *pora.*

The doses to be applied will depend upon the previous history of the field. If the field was fallow in *kharif,* apply a 100 pounds of ammonium sulphate and 125 pounds of superphosphate per acre; after *bajra* or *jowar* in *kharif,* the recommended dose is 40 pounds nitrogen +20 pounds P_2O_5 (200 pounds of ammonium sulphate+125 pounds of superphosphate); and after a previous *rabi* legume and *kharif* fallow, only 20 pounds of nitrogen (a 100 pounds of ammonium sulphate).

For an even distribution of the fertilizer, when it has not been "placed," it is essential to mix it with dry earth in the ratio of 1 : 5. Distribute this row-wise instead of scattering all over the field.

On highly productive soils, when the general crop growth is very luxuriant, broadcast only about ten pounds of nitrogen or 50 pounds of ammonium sulphate within the crop rows just at heading. This will make the grain plump but will not lead to the lodging of the crop.

When urea is the available fertilizer, apply it four to five days before sowing if the soil of your field has enough moisture; otherwise, dress it a day before seeding. As far as possible, do not topdress urea as nitrogenous fertilizer. The drilling of urea five to six inches deep in the soil has been found more effective than its surface application.

Topping

Very luxuriant wheat crops require topping to avoid lodging. Lodging may reduce the yield by over 50 per cent if it happens before heading and immediately after grain-setting. The loss is reduced if the lodging of the crop takes place later. Slight topping in some luxuriant crops helps reduce lodging. The time for topping is usually 80 to 90 days after the sowing of the crop.

BARANI WHEAT

A wheat crop raised under rain-fed conditions requires a little extra care for obtaining an increased yield. Some of the steps needed to be taken are listed below.

Conservation of rain water

The first important thing is *watt-bandi* or the bunding of the fields. The second is to conserve moisture while fields are ploughed. For this, planking with a *sohaga* more frequently is necessary. Rolling the fields before sowing brings up the moisture.

Sow deep

Deeper sowing is advocated to obtain a fuller germination of seed and to reduce picking of grain by birds. This ensures a good start for the crop as the roots can draw upon the ample supplies of soil moisture available.

High seed-rate

The seed-rate should be over 35 to 40 seers for an acre or seven seers per *bigha.* About five seers more should be used in white ant-infested fields.

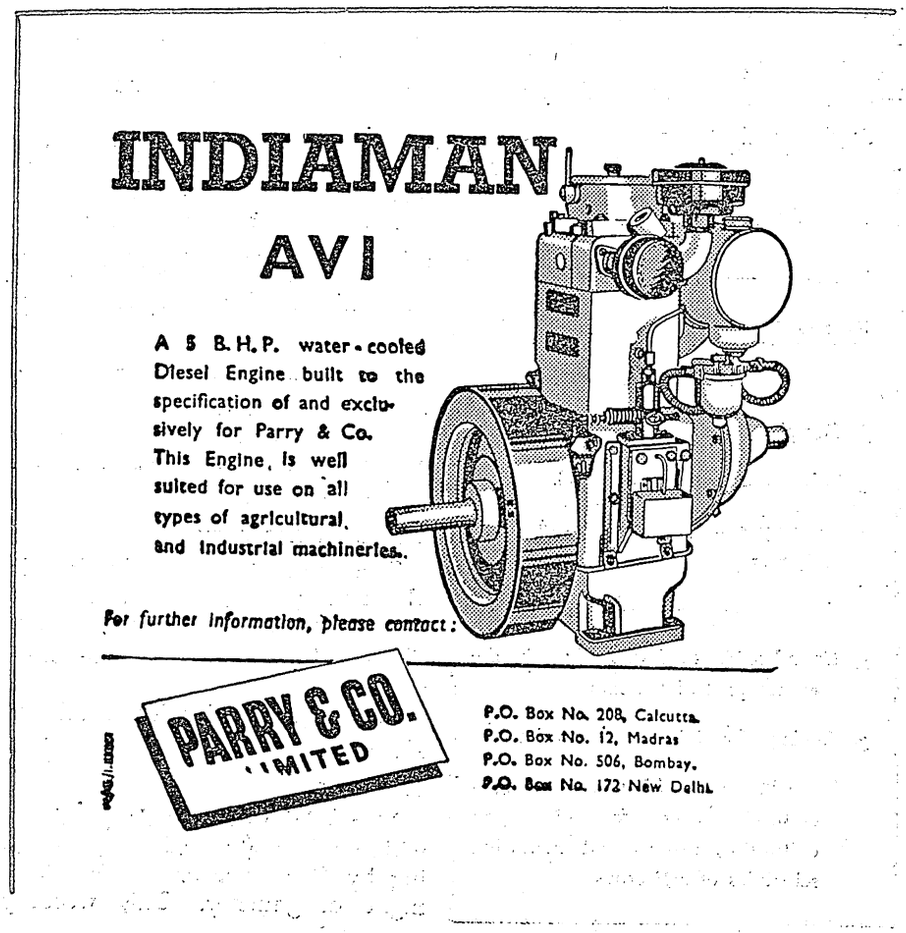
Wherever possible, the seed should be treated with "Agrosan GN" and BHC at the recommended rates.

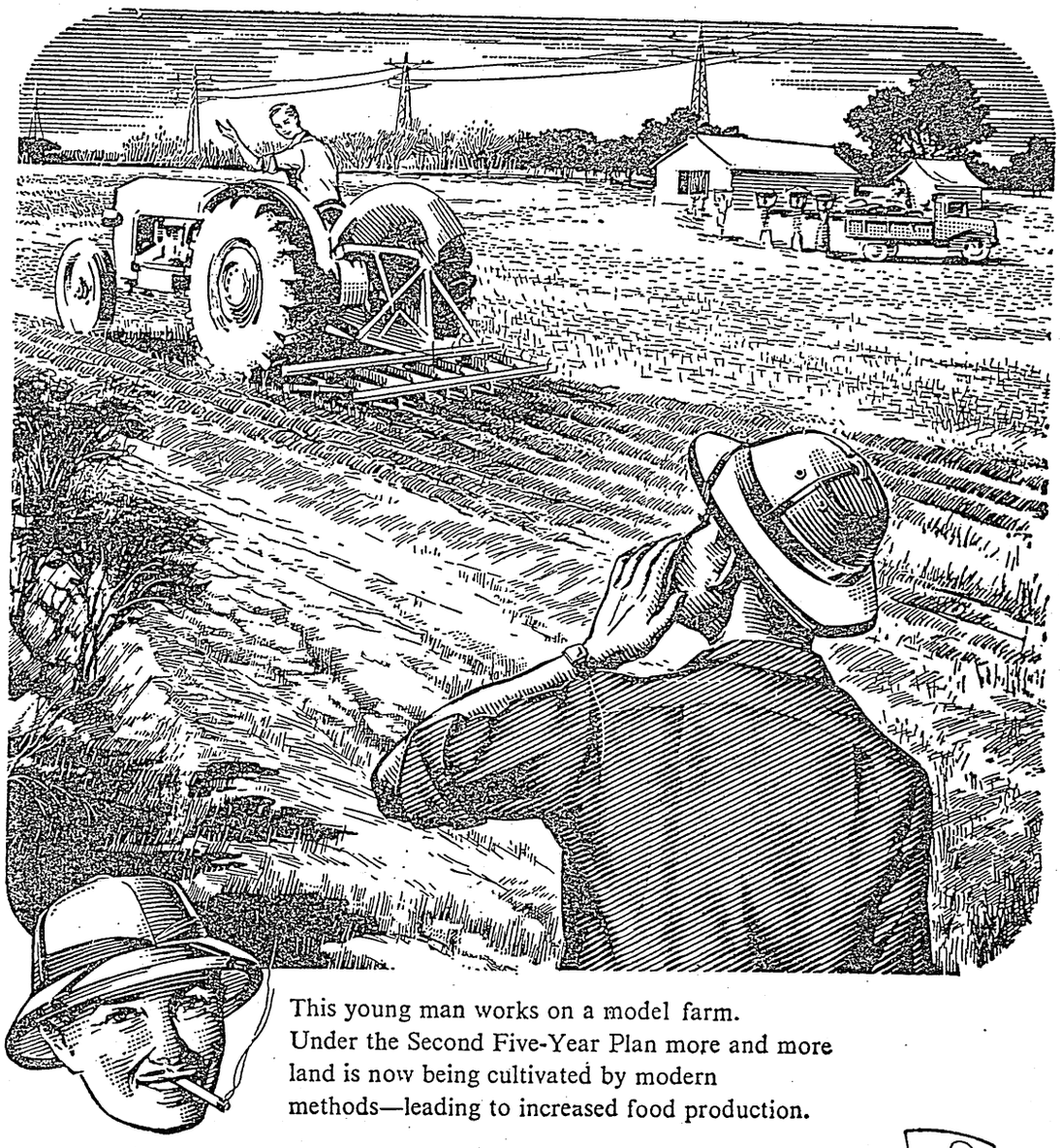
Eradication of weeds

Two to three hoeings help conserve moisture by eradicating weeds and by forming a mulch on the surface.

Efficient use of winter rains

For an effective absorption of winter rains, partition bunds in the fields help reduce loss of water and help in penetration of water into the soil.





This young man works on a model farm.
Under the Second Five-Year Plan more and more
land is now being cultivated by modern
methods—leading to increased food production.

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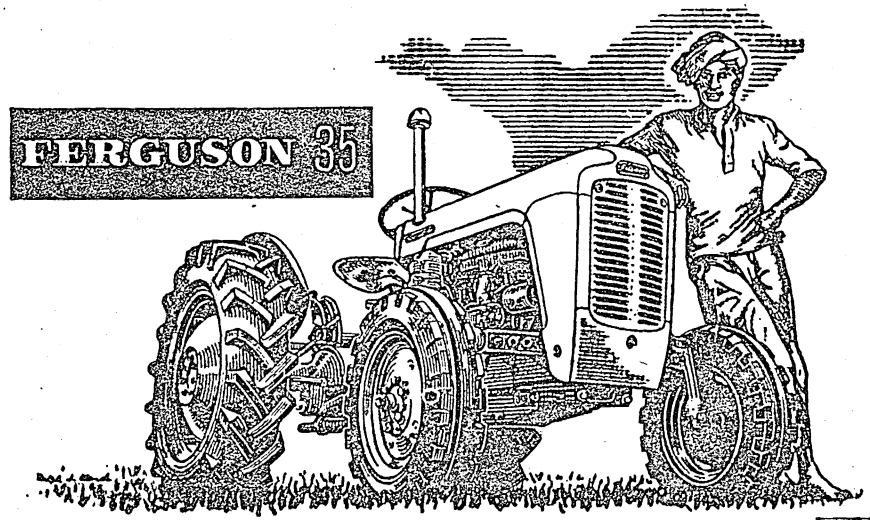
My basic job is to assist in raising this country's food production from its present low level—so low that we have to buy abroad.

The extent to which I can help is very often not realised—it certainly is not realised enough.

Whether it is wheat or rice—gram or grass—sugar or groundnuts—whatever it is, only I can reliably and economically :

- Have the soil ready for the rains or water,
- Prepare the best tilth to suit the crop,
- Sow quickly and well on the right day,
- Give the crop attention whilst it grows,
- Harvest at the right time,
- Do, in time, all those never-ending duties such as agricultural bunding, soil conservation, water distribution and so on—which mean the difference between shortage and enough.

MECHANISATION MEANS MORE MEALS



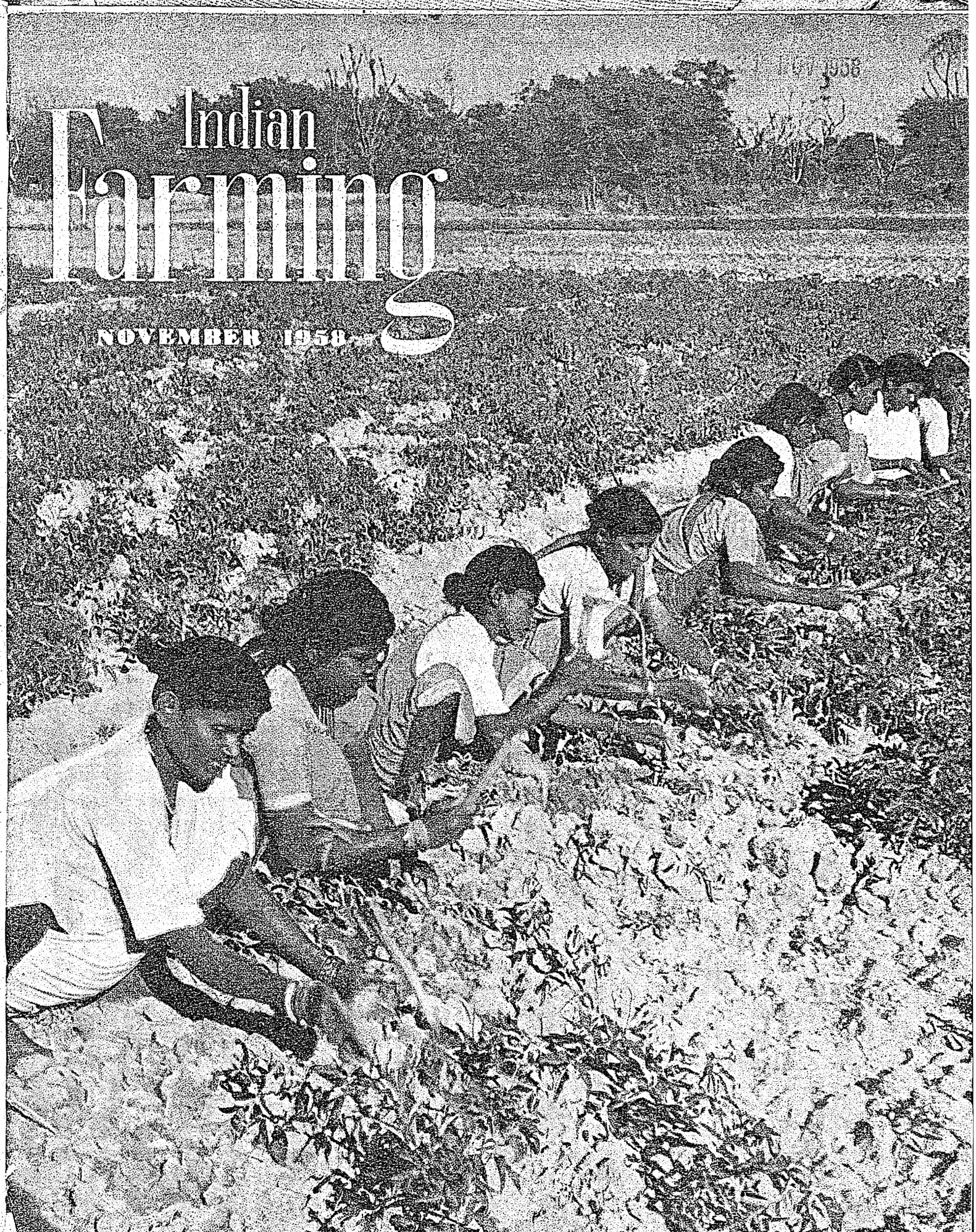
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Indian Farming

NOVEMBER 1958





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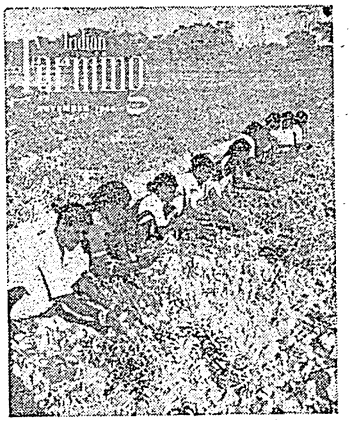
TATA-FISON

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21 NOV 1958

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editor's page

GOOD SERVICE!

IN INDIA'S march towards self-sufficiency in cotton, of no small measure has been the contribution made by the Technological Laboratory of the Indian Central Cotton Committee. Since 1924, the year of its establishment, the Laboratory has helped cotton breeders sift and finally select varieties for different cotton-growing tracts of the country by undertaking fibre and spinning tests.

Suitable appliances and techniques evolved at the Laboratory have made it possible to carry out these tests more efficiently. These are: a small roller gin for small quantities of the produce, a Ginning Percentage Balance to determine the ginning outturn of a cotton in a single weighment, formulae to predict the spinning value from data on fibre characters, a Microspinning Technique to assess the spinning value of a strain from a small quantity of the produce, a new dyeing technique to determine the maturity count of a cotton without the aid of a microscope and a Stapling Apparatus to assess the staple length of a cotton.

And now a look at statistics. While in 1922-27, the long staple cottons constituted only 13 per cent of the total production, in 1956-57 the figure stood at 41 per cent with a corresponding decrease in the production of short staple cottons from 58 to 17 per cent, despite a setback in 1947 due to the country's partition. The distribution of improved varieties duly tested at the Laboratory accounted for an additional income of 14·1 crores of rupees for the cultivators of these superior strains during 1956-57.

Thus, the Laboratory can rightly claim a good share of the credit for bringing the country to its present position when 90 per cent of the needs of the textile industry for raw cotton can be met from within the country. More hopes are pinned on the Laboratory for the future in increasing the production of extra long staple cottons which we still have to import to a large extent. With sustained efforts on the part of the cotton breeders in this direction and further modernization envisaged for the Laboratory, this should be possible in no distant future.

New-type Education

THE PUSA POST-GRADUATE SCHOOL

Would Provide

by

M. S. Randhawa

A NEW Post-graduate School of Agriculture came into being on the 6th of last month at the Indian Agricultural Research Institute at New Delhi, popularly called the Pusa Institute. The School will provide training leading to the award of degrees of Master of Science and Doctor of Philosophy in the various fields of Agricultural Sciences. The School has been organized on the recommendation of the Indo-American Team on Agricultural Research and Education and made possible with generous aid from the Rockefeller Foundation. The training imparted at the School is designed to be of a standard comparable with that obtaining in the very best institutions of the world. This is a significant event not only in the life of the Institute but also the history of agricultural education in India, inasmuch as it would obviate the need for our youngmen to go overseas for this type of education, which for obvious reasons is not always possible.

India is on the threshold of an ambitious agricultural development programme phased under the Five Year Plans. The successful implementation of this programme would rest, more than any factor, on the provision of suitable technical personnel. The one aim behind the establishment of the School, therefore, is to build up an organization turning out qualified experts capable of exploring with meticulous objectivity the many problems of Indian agriculture and devising suitable means of achieving quick progress with the resources at our command.

SIGNAL HONOUR

The Pusa Institute happens to be the premier organization in the country to be developed with that aim in view. This is a signal honour, and a well-deserved one. Ever since its inception in 1905, the Institute has endeavoured to bring science to the service of Indian agriculture. The main functions of the Institute are, firstly, to advance the knowledge of Agricultural Sciences with the object of improving the theory and practice of agriculture—the principal means of livelihood for the majority of our people—and, secondly, to impart post-graduate training of the highest standard in the different Agricultural Sciences. It also carries out important survey and advisory work with a view to carrying to the farmer useful results of research.

The Institute has inherited a lofty tradition of agricultural research going back to the work of Leather in agricultural chemistry, of Butler on fungi and fungal diseases of plants, of Maxwell-Lefroy and Fletcher in the cataloguing and combating of insect pests and of the Howards in breeding new strains of crop plants, including the early *Pusa* wheats. This tradition has been kept up by the work of Venkataraman at the Sugarcane Breeding Substation at Coimbatore, till recently a part of the Institute, resulting in the production of the famous *Co.* varieties of sugarcane which have been largely instrumental in revolutionizing the sugar industry of the country, and, recently, the evolution of a number of improved varieties of wheat which are gaining popularity on account of their superior yielding ability and resistance to rust and smut—two stark enemies of the wheat crop in India.

WELL-EQUIPPED

The Institute as at present is divided into seven Divisions—Agronomy, Agricultural Engineering, Botany, Entomology, Horticulture, Mycology and Plant Pathology and Soil Science and Agricultural Chemistry, housed in separate buildings complete with ancillary buildings and installations such as workshops, glass-houses and experimental grounds. A number of important research schemes of the Indian Council of Agricultural Research and the various Commodity Committees are being executed at the Institute, which is also the headquarters of the Cereal Improvement Programme and the All-India Soil Survey and Land Use Organization with which the 24 soil-testing laboratories situated in various parts of the country are linked. The Institute has also kept abreast of the latest

developments in the field of agricultural research in other parts of the world, and use of radioactive isotopes for research has been made here for some time and a scheme for establishing a gamma field is being implemented. The Institute possesses a self-contained radio-tracer laboratory. The other assets of the Institute are an excellent library and teams of qualified experts including some of the most distinguished agricultural scientists of the country.

The Institute is not new to the field of agricultural education either. It offers perhaps the best facilities in this field in the country. It has been providing facilities for post-graduate training since 1923. The "Associate Indian Agricultural Research Institute Diploma" course is recognized throughout India as equivalent to M.Sc. in Agriculture. But, it was not until 1945 that regular syllabi of studies were laid down and regular courses of instruction involving lectures, laboratory practicals and field work followed by a regular examination introduced. The Institute has been recognized by many universities in India as a place where their alumni can work for doctorate degrees.

PROGRAMME OF EDUCATION

The programme of education in the new Post-graduate School will be under the overall supervision of a Dean of Post-graduate studies responsible directly to the Director. The Dean will be assisted by a Post-graduate Council, with himself as Chairman, consisting of the Director of the Institute, senior representatives of the various Divisions, the Adviser on Post-graduate Education, certain representatives of the Faculty and the Registrar, as Secretary. The Post-graduate Council will be the final authority on all academic matters and all matters pertaining to the School.

The Post-graduate Faculty will be presided over by the Dean. To a very large extent, the Faculty members will be jointly responsible for education and research, but will have to devote a certain defined portion of their effort and time to post-graduate instruction. The Heads of the various Divisions will have overall responsibility for the teaching and research activities of the Divisions.

Each student's programme will be under the guidance of a Standing Advisory Committee consisting of two staff representatives from his major field and at least one from each minor field. The Committee will guide the student in the choice of his courses and other matters pertaining to his academic activities in the Division.

SOUND MASTERY

The programme of training in the School will be designed to give the students a sound mastery of their respective fields of concentration, not only in the immediate field of their specialization but also in the closely supporting scientific disciplines.

Each student will have an adviser who will be from his major field of studies. The student's programme will be planned, taking due account of his previous academic training, in consultation with his adviser, so as to provide a core of subjects in the general field of the student's major specialization and a secondary grouping of courses in the fields of at least one minor supporting discipline in the case of candidates for the M.Sc. degree and two in the case of candidates for the Ph.D. degree. The Students' Advisory Committee will be given considerable latitude in the choice of courses in the major field and in the distribution of courses among the minor fields taking due account of the requirements to provide training for high level scholarship and research in a candidate's particular field, with the final approval of the Dean.

Two academic years will ordinarily be required for the programme of course work, research, thesis preparation and examinations leading to the M.Sc. degree. The academic year will start from October and will be divided into three trimesters. A minimum period of two years after the M.Sc. programme will be required for the Ph.D. degree. Associates of the Institute and candidates holding M.Sc. degrees of other recognized universities will be eligible for admission to the Ph.D. course.

DISCRETE UNITS

The courses will be organized as discrete units or blocks of subject-matter. The courses are assigned a certain number of credits, a credit representing about twelve hours of lectures and the necessary reading and outside-the-class preparation, or about twelve practicals of nearly three hours' duration each. Each course will be so planned that it can be completed within a given trimester. A student's programme may not include more than fifteen credits in any one trimester.

A minimum of 45 credits of successful post-graduate work will be required of a student preparing for the M.Sc. degree, in addition to any courses required to make up deficiencies in his under-graduate training and the preparation of the thesis. The course work will receive primary emphasis during the first part of a student's programme, so as to give him the requisite background in the scientific disciplines; the later part of his programme will lay a heavier emphasis on research. The exact minimum number of credits required for the Ph.D. candidates will be determined in each individual case by the Students' Advisory Committee with the approval of the Dean.

COMPREHENSIVE EXAMINATIONS

The instructors will measure and grade the student's performance and his mastery over facts in the various courses. After successfully completing his course work, as judged from the grading, he will be given a series of comprehensive examinations under the direction of a committee including representatives from his major and minor fields and external examiners. In these examinations, papers in the various subjects will be followed by an oral examination with the Committee as a whole in session.

Each student will submit after admission, with the approval of his adviser, the title of his thesis and a complete programme of work to be offered for the degree. This thesis will be in partial fulfilment of the requirements for the degree. The thesis will be on a topic falling within the field of the major subject. The research work for the thesis for the Ph.D. degree will be of a higher order and definitely of an original nature. The title of the thesis and the programme of work will have the approval of the Students' Advisory Committee and the Dean.

The thesis will be based on the candidate's own research work. For the M.Sc. degree, the thesis will be examined by the adviser of the candidate and an external examiner appointed by the Post-graduate Council; for the Ph.D. degree, a committee of three members appointed by the Post-graduate Council will evaluate it.

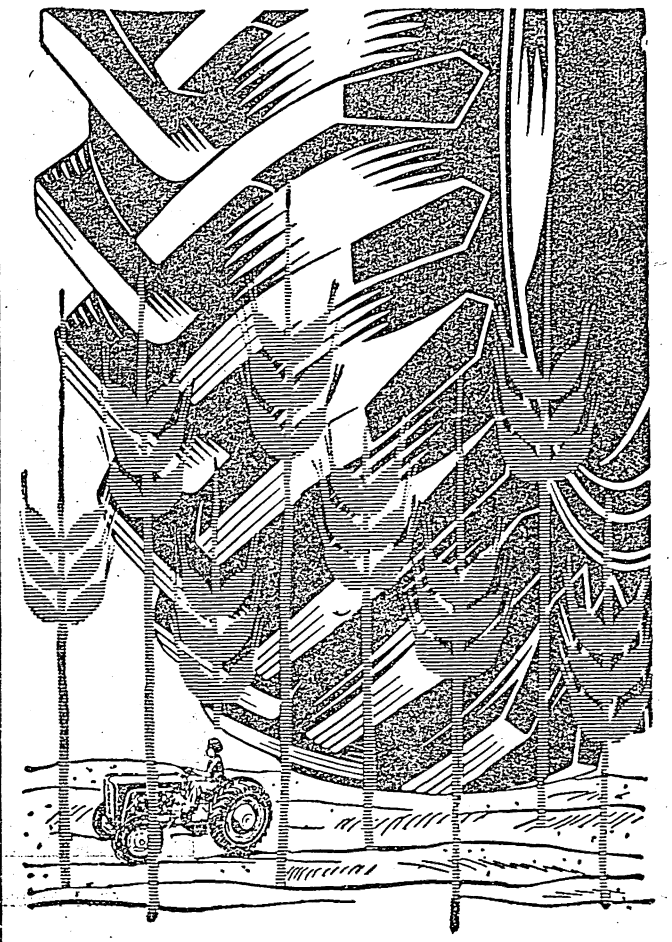
An oral examination for the M.Sc. degree and the Ph.D. degree on the subject of the thesis will be held jointly by the examiners after adjudication of the thesis. A student must make a satisfactory defence of the thesis as judged by the examining committee.

VISITS TO INSTITUTES

In addition, the students may have to visit, if their training so requires, the different Central Institutes and the Substations of the Institute where work is carried on under different soil and climatic conditions.

It will be seen that the new system of education differs very much from the one involving a rigid syllabus followed by a rigorous examination commonly adopted by our universities. An important feature of the new system is an intimate student-teacher relationship, and in that it takes its cue from the systems and practices prevailing in American universities. Each student will be under the personal charge of a number of experienced scientists who will watch his progress from day to day and continue to give him guidance.

Needless to add that the students passing out of the Institute after the completion of their training will not only be thoroughly well-versed in their respective fields but will also have inculcated a spirit of dedication to the service of agriculture of their country.

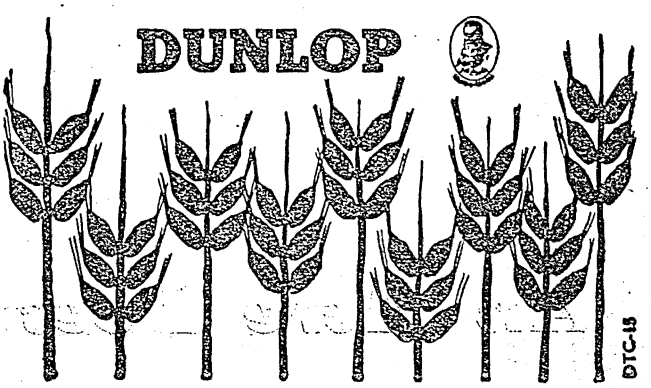


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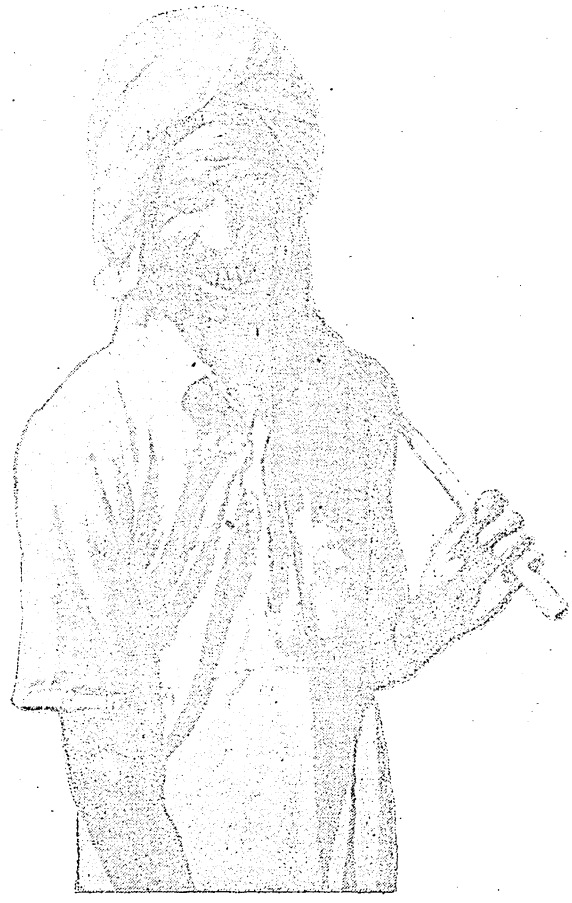
DUNLOP



DTC-15

Man of the Month

An Acre Does the Job of Two



Shri Balbir Singh

by
Harkirat Singh

"THE man of time"—that is how they have nicknamed Balbir Singh in the village Alipur of Delhi State. Reason: whether he is preparing the land, sowing the crop, applying fertilizer, or irrigating, he always does it right on time. Result: he gets from an acre what others in the area get from two; on top of it, he is the first to reach the market with his produce and brings back a better price for it. His favourite crop: wheat.

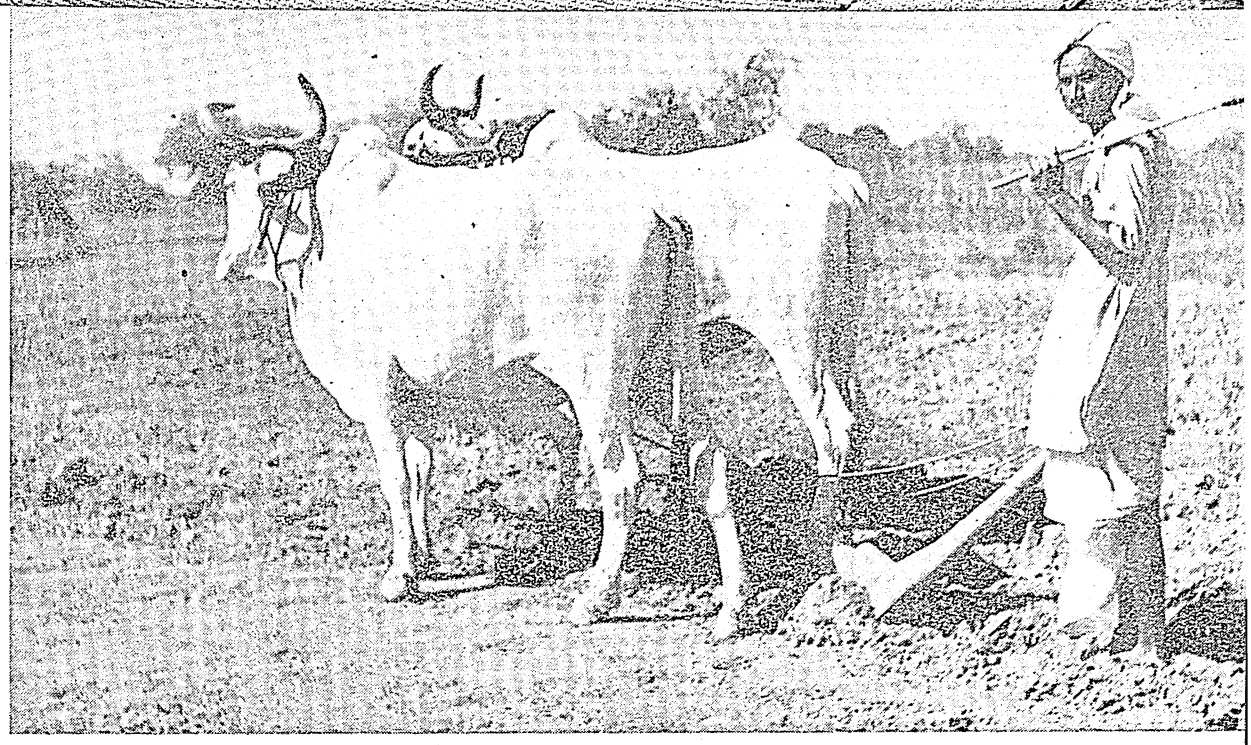
At the time I visited his farm last month, he was busy giving finishing touches to his seed-bed for wheat, with what appeared to me like a perpetual smile on his face. "Today is 20th, and I *must* start sowing the crop on the 25th," he told me. "Others put more acres under wheat, I get more wheat from the acre, minimum 30 maunds compared with the average of 15 maunds of others, simply because I've learnt never to 'miss the bus' even if I've to put in a little extra labour to keep to my schedule," he proudly added. Of his total 11 acres, he is putting four under wheat this *rabi* and keeping the remaining seven for gram.

WHEN IT NEEDS

Balbir gives at least 12 ploughings, six *sohagas* and two clod-crushings to prepare his field, the first ploughing with a soil-inverting plough. If the land is fallow at the time, an additional hot-weather and a winter cultivation are also added to the list of operations. So that the ploughings are really effective, these are given "just at the time the land really wants them", to use his own words, meaning whenever it is in *wattar*, but not wet.

Nine cartloads of farmyard manure per acre—"all of it prepared on my own farm"—is the dose Balbir has fixed for applying to the field at the time of preparation, any shortfall being made up with urban compost bought from the nearby Badli dumping-yard. This *rabi*, he plans to use superphosphate also, at a maund per acre, before sowing.

N.P. 718 is the wheat variety he uses. "Gives more yield, is disease-resistant, ripens about ten days



Balbir stops his bullocks for a while to pose for me

earlier." He usually saves his own seed for the next year's crop, but makes it a point to get fresh seed every third year.

The seed receives an "Agrosan GN" treatment. "If termites are found in the field, they get a good reception with BHC and if field rats make their appearance, I 'entertain' them with zinc phosphide baits," he put in good humouredly.

SOWS WITH *PORA*

He sows the crop by the *pora* method, using a seed-rate of 50 seers per acre. The distance between the lines is kept at six inches. Some portion of his land is low-lying and so often gets the flood waters. While sowing on that area, he drills ammonium sulphate at 25 seers per acre along with the seed. The same quantity is given again at the time of the first irrigation, that is, about a month after sowing.

After about a week of the first irrigation, the crop receives a weeding. A total of four irrigations, one less if rains are received, is given to the crop, at intervals of approximately a month. "An irrigation just when the crop has started flowering, however, is a *must*," Balbir said.

USES THRESHER

The crop is harvested by sickles with the help of hired labour, and threshed with the "Olpad" thresher. While cutting the crop, any weed plants such as *pohli* that may be noticed coming up are pulled out.

The rotation generally followed by Balbir is *kharif jowar* or *bajra*--gram-fallow-wheat. "Didn't have a good gram crop for years," he told me. "Thanks to the *rabi* campaign, we are getting some good seed this year. That's why I've reserved a big chunk of my land for it," he said.

When I turned my back to leave, I could hear Balbir tut-tutting his bullocks with a little extra speed. I remembered he had set a deadline before him for sowing his wheat crop. He was perhaps making up for the time he had spent in talking with me.



Discussing merits of the new gram seed with Village Level Worker Hukam Chand



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HLL. 16-X52

Sewage is Doing Good Work on the Mysore Farm

by
R.P. Talati
Compost and Sewage Development Officer
Ministry of Food and Agriculture
New Delhi

ENCOURAGED by the consistent success achieved in utilizing the city sewage for raising crops, the Mysore Municipal Committee has been extending the area under its sewage farm from year to year.

Mysore is one of the most beautiful cities of southern India with a population of about 2½ lakhs. It is a very clean city and is partially sewered. The natural drainage of the town is towards the south of the city, where the Municipal Committee maintains a sewage farm.

The estimated sewage flow is about two million gallons per day. The sewage is utilized on the farm after septic tank treatment. Formerly, half the sewage was let out in a raw condition, as the capacity of these tanks was to treat only about a million gallons per day.

In 1956, however, an additional septic tank, a grit chamber, a high level reservoir, a pump-house and three pumps of 30 H.P. each were provided with the help of a loan from the Government of India. The septic tank was meant to treat the remaining sewage. The pump-house and the pumps were meant to command another area of about 150 acres. The high level reservoir was meant to distribute the sewage effluent uniformly in the newly commanded area.

The soils of the farm vary from sandy loam to loam, are fairly level and have a good drainage. They were found to be overdosed with sewage and hence their improvement was also undertaken. Analyses of the raw and treated sewages are given below.

	Raw Sewage	*After treatment in the septic tank*
	(*Parts per 100,000*)	
Total solids	144	118
Suspended solids	64	40
Chlorine	13.8	13.4
Free and saline ammonia	3.1	2.2
Albuminoid ammonia	2.3	1.8
Oxygen absorbed in four hours at 27°C	5.9	5.0
*p*H value	6.9	7.0
Nitrites and nitrates	Nil	Nil

The area under different crops on the farm is given below. It will be seen that 122 more acres were under sewage farming in 1957-58 as compared to 1955-56.

Crop	*1955-56*	*1956-57*	*1957-58*
	(*Area in acres*)		
Coconut	77	90	120
Vegetables and fruits	11	17	25
Dry and rotational crops	—	10	30
Perennial grass	65	80	100
Area under roads, buildings & other constructions	33	33	33
Uncultivated area	179	135	57
Total	365	365	365

The crops have been giving the following average yields: perennial grass (very old crops)—22 tons (annual); coconuts—1,923 (new plantation); *ragi*—684 pounds;

Contd. on page 22

Tall and stately coconuts planted along the roads bring in considerable revenue



Maybe That Pork Carries a Tapeworm

by

S. S. Ahluwalia

U. P. College of Veterinary Science and Animal Husbandry

Mathura

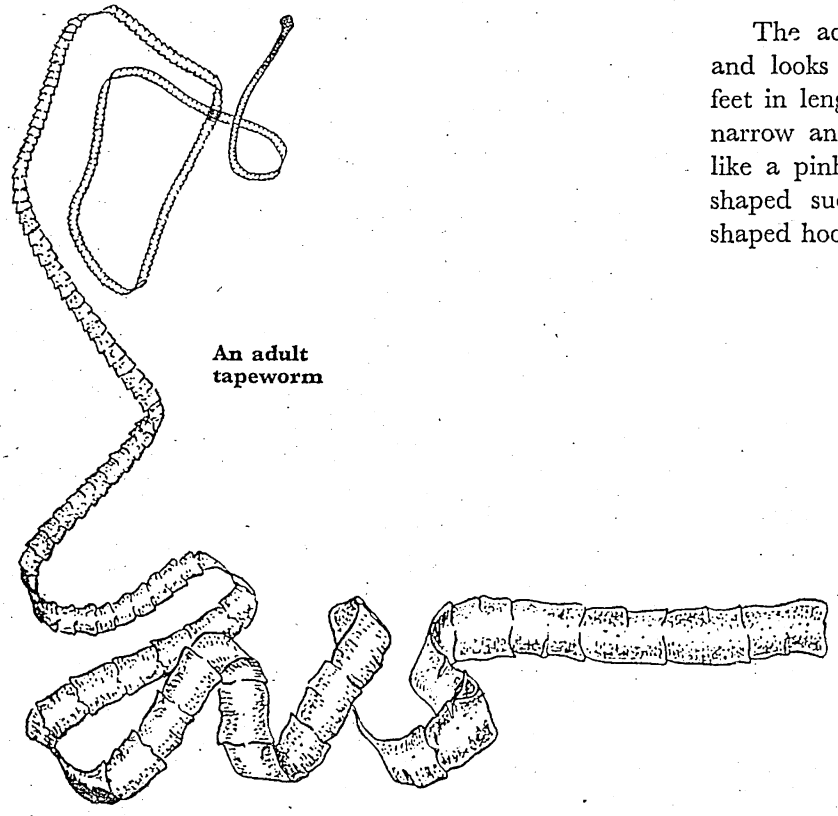
PORK was suspected, even during the ancient times, of infecting human beings with certain worms. Nearly a century back, by experimental infections conducted in pigs, "bladderworms" were recovered from their muscles. Later, Kuchenmeister fed a condemned criminal with infected pork and, after four months when the criminal was executed, adult tapeworms were recovered from his intestines during the *post mortem* examination.

Parasitic worms inhabiting the human intestines are divisible into two broad groups—round worms and flat worms. The latter group includes the tapeworm, which is ribbon-like in appearance. Commonly known as the "pork tapeworm," it is acquired by eating infected pork and is found in the food canal of man. It is usually found singly, and so was designated *Taenia solium* (Latin sol-single).

Pork from a normal healthy pig is uniformly light pink in colour, but when the younger infective stages of the tapeworm are present in it, it becomes studded with milky white spots of the size of a pea seed to a tapioca and is commonly called "measly pork." However, it has no connection with the common measles, and each spot is, in fact, a larva of the tapeworm lying enclosed in an opalescent bladder full of clear, watery fluid. This larva is called bladderworm or *Cysticercus cellulosae* and, when examined under a microscope, is seen to bear a crown-like circle of hooks on its top along with four muscular cup-shaped suckers at the corners.

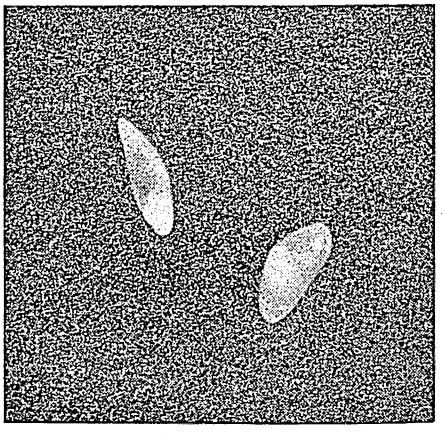
A large number of such bladderworms may be found embedded in the muscles of the pig especially in the regions of the thigh, shoulder, neck, tongue, heart and the midriff. When such infected muscles are cut through at the time of dressing the carcass, pork measles can be easily detected. These structures in certain parts of Uttar Pradesh are commonly known as *vinolia.*

The adult living worm is whitish semi-translucent and looks like a ribbon. It may measure up to ten feet in length and half an inch in breadth. The much narrow anterior end has the head or scolex which is like a pinhead in shape and size. It bears four cup-shaped suckers and a number of powerful dagger-shaped hooks arranged like a crown round the eversible



An adult tapeworm

Complete bladderworms taken out from infested pork



tip. This apparatus acts as a hold-fast organ allowing the head to remain firmly attached to the intestinal wall while the rest of its body lies free in the food canal like an anchored tape in a flowing water channel.

The worm is, in fact, a long chain of about a 1,000 square blocks or segments situated one behind the other. Each segment, containing both male and female reproductive structures, is capable of producing numerous eggs, and really is an independent and self-sufficient member of the colonial chain. New segments are constantly produced from behind the head and these young, immature segments get pushed back gradually. The segments at the tail end are the oldest ones and are known as "ripe" segments. Each ripe segment measures $\frac{1}{2}$ inch $\times$ 1/5 inch and is packed with about 40,000 eggs.

SHORT CHAINS

Short chains of ripe segments, resembling pumpkin seeds, break off from the tail of the ribbon and are passed out almost daily along with the stools of the patient. The segments on disintegration liberate the eggs which are not visible to the naked eye and thus get scattered over the surroundings. Each egg is a potential tapeworm and is known to remain viable up to six months.

Pigs feeding on such contaminated grounds ingest these eggs and become infected. The eggs carried in the blood get deposited in the musculature and develop into bladderworms in about two months' time. The infected pig, as a rule, does not manifest any pronounced ill effects and apparently seems to be quite healthy—an example of complete harmony between the parasite and the host. Incidentally, it may be mentioned that the diagnosis of infection in such a pig is really very difficult.

The bladderworm cannot undergo any further development in the pig but awaits an opportunity to reach the intestines of man, where alone it can grow to maturity. This is only possible if man happens to eat raw, undercooked or insufficiently cured measly pork.

A large number of bladderworms may be found on cutting open an infected muscle



After ingestion, the bladder is digested away but the larva attaches itself to the lining of the human gut by means of its anchoring apparatus. The neck then elongates and by segmentation grows to a mature tapeworm in about three months' time.

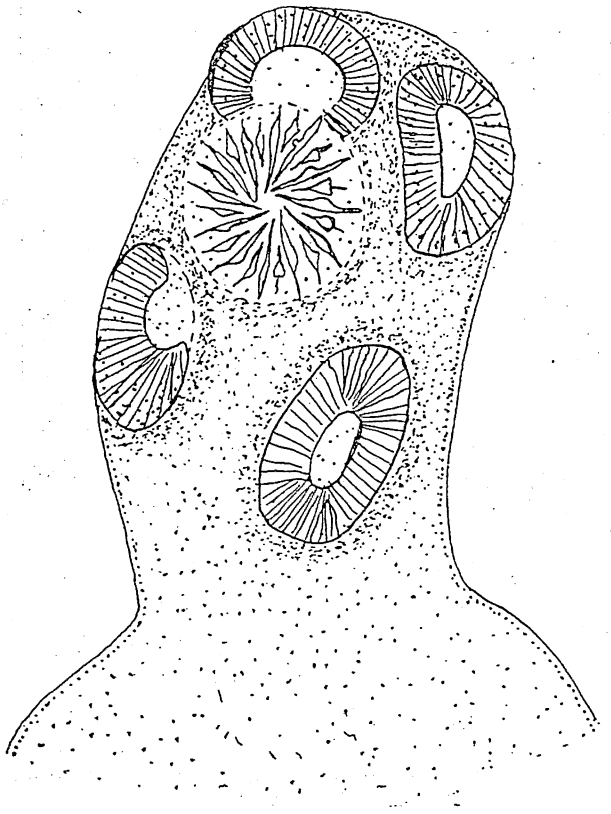
RAVENOUS APPETITE

The adult tapeworm may live up to 25 years in man, and cause no appreciable symptoms. But due to other debilitating factors, the patient may manifest abdominal discomforts, vague pains, chronic indigestion, diarrhoea, vomiting and anaemia. Besides, the knowledge of its presence may create alarming nervous symptoms. A "ravenous tapeworm appetite" and hunger pains are often associated with this infection and the patient may not put on weight in spite of the increased food consumption. These symptoms, however, disappear when the worm is expelled out.

The most alarming aspect of this disease is autoinfection, in which case the patient may accidentally ingest the eggs of the harboured worm passed out in the faeces which had come to stick under his finger nails, etc., during ablutions. These eggs develop in the human body, just as in pigs, and the bladderworms may settle in the brain or even in the eyes where they may cause serious nervous symptoms like epileptic fits and even blindness.

In 1947, it was estimated that of the entire world population 25 lakh people harboured this parasite.

The head of the bladderworm with the crown of hooks and suckers



Surprisingly enough, the incidence of the tapeworm among the human population of India is quite low. An exact estimate of the incidence is, however, difficult as no organized surveys like those in certain other countries have been conducted. The infection is believed to be common among certain sections of the people particularly those connected with the trade of pigs and their by-products.

As there are no well organized pig farms in our country, these animals are reared by sweepers and certain other castes as a sort of cottage industry. The animals are generally let loose by them and usually act as scavengers in the towns and their outskirts. This, coupled with the practice of certain class of our people to defecate in the open and other prevalent unhygienic conditions, affords optimal opportunities for the pork tapeworm to perpetuate its race amongst men and pigs.

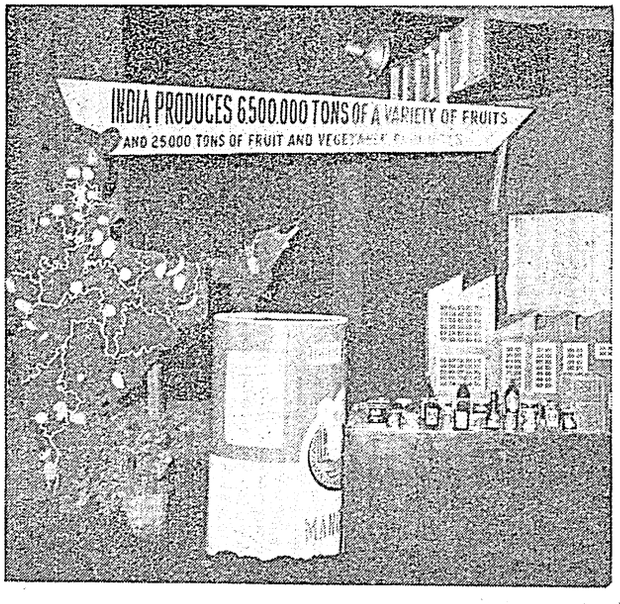
THOROUGH INSPECTION

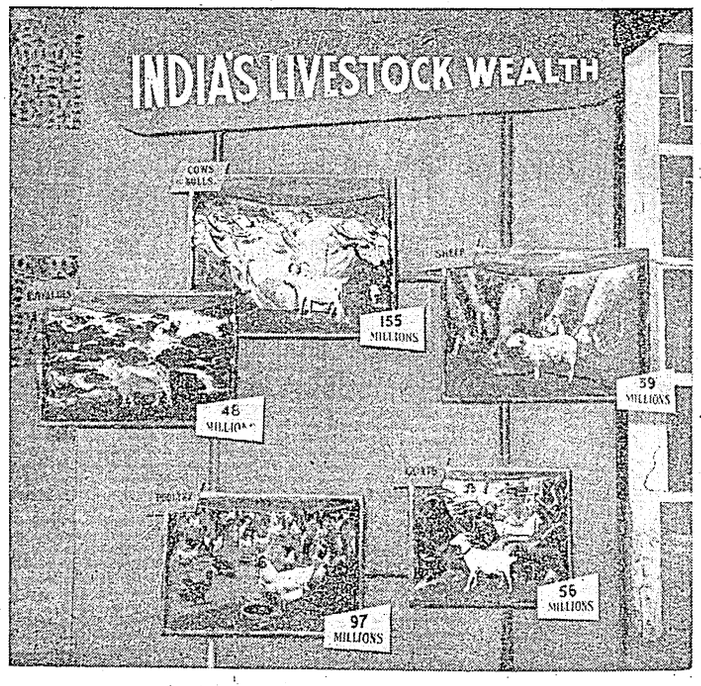
Measly pork is said to be commonly encountered in the slaughter-houses of Calcutta, Madras and Ootacamund. Also, it is customary for pig-keepers to slaughter one or two animals in their own houses and pass the pork on to the consumers without subjecting it to any meat inspection. Even where inspection is done, unlike other countries it is not conducted rigorously. To safeguard public health against tapeworm infection and a number of other meat-borne diseases it is imperative that all meat, before it is released in the market for sale, must be subjected to a thorough inspection by a competent veterinarian. In the absence of such a safeguard, the unwary customer may fall a prey to various infections by consuming morbid or infested meat.

Thorough cooking renders the pig meat safe for human consumption. However, roasting, smoking and pickling, which are also quite in vogue, prove ineffective in destroying the bladderworms.

The control of this worm is, therefore, a matter of personal and public hygiene, as the sole source of infection is the egg in the human excreta. A proper disposal of night-soil, a control over the pigs and a rigorous meat inspection would help minimize this infection. Further, all persons connected with the pig industry should undergo a periodical check-up and those harbouring the worm should be given suitable medication.

At "India 1958"





Two exhibits at the Food and Agriculture pavilion of the "India 1958" Exhibition. The one on the right shows the livestock wealth of India, while that above depicts graphically our fruit products industry.

The Exhibition which was opened in New Delhi on 8th October, 1958, has been drawing large crowds.

Photos: Extension Wing, Ministry of Food and Agriculture

dependable jute seed, and at your own farm



Sunning the twigs before threshing

by

S. P. Das
Farm Manager, Jute Seed Multiplication Farm
Krishnagar, Nadia

THE reason why the average jute grower fails to produce jute seed of a good quality is simple: in an effort to release his land for the next winter crop and to obtain fibre as well as seed from the same plants, he hastens to harvest his crop when the seed-pods have not still matured.

As a result, the jute seed produced is generally poor in germination and gives low yields. Most cultivators, therefore, approach the State Agricultural Department whenever they are in need of jute seed. However, by following the method given here they can produce good-quality jute seed on their own fields.

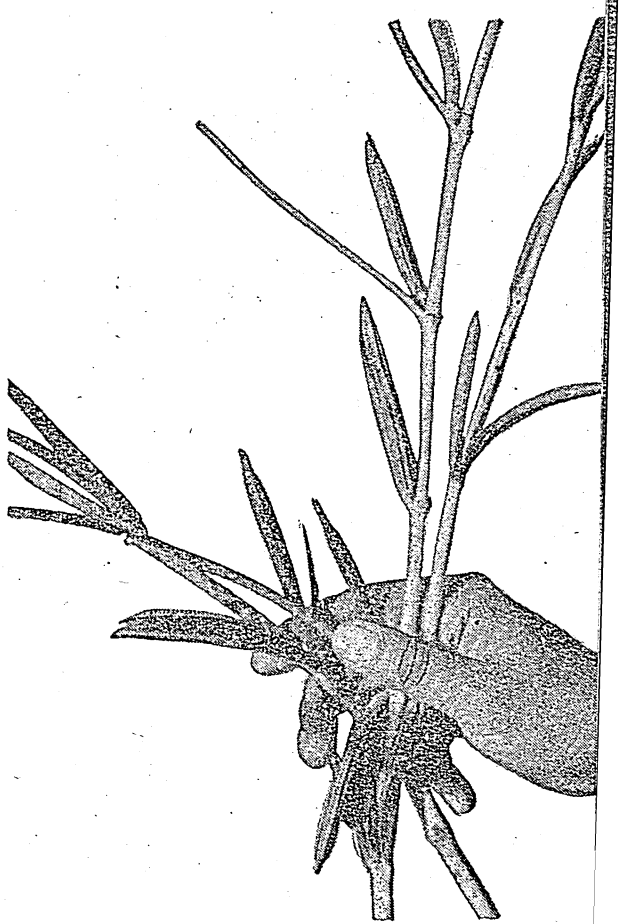
When jute is sown at the usual time, that is after the first heavy shower in May or in early June, the seeds become ready for threshing towards the beginning of November with the seed-pods turning brownish. However, all the pods do not mature at the same time.

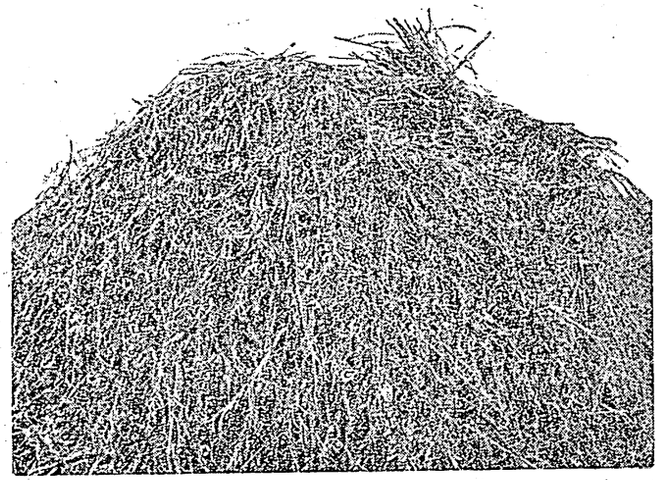
The pods may be harvested by cutting the twigs bearing them. This should be done on a bright sunny day when the surface of the pods is completely dry. A hot sun is to be avoided as the pods would then burst and much of the seed would scatter in the field and be wasted.

At the time of cutting, the twigs and pods contain about one-sixth their weight of moisture. These may, therefore, be dried on the threshing floor itself in loosely tied bundles kept with their tops upwards; tightening of the bundles leads to rotting. After drying, the twigs may be heaped. This pre-threshing treatment prevents damage to seeds.

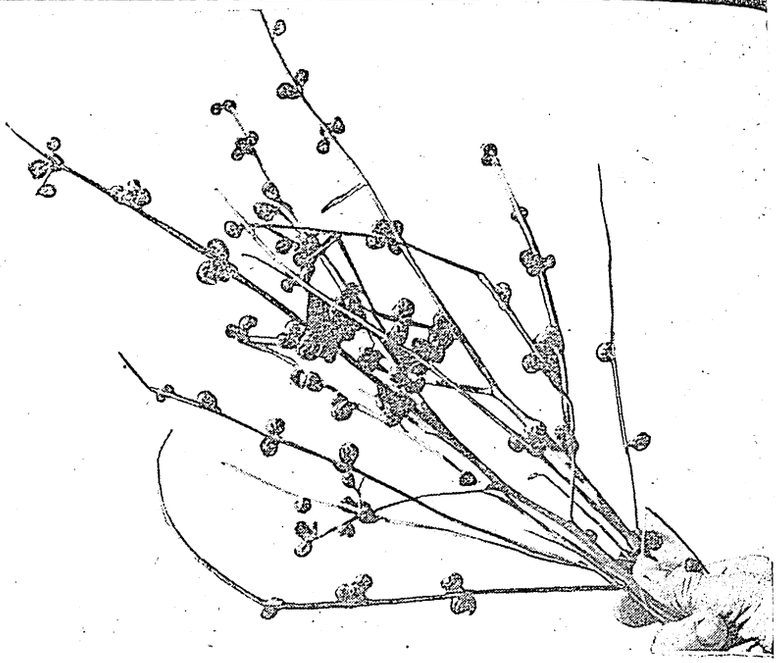
Threshing may be done either by beating with

Seed-pods of *Olitorius* jute ready for harvesting





After drying them in the sun, the twigs bearing seed-pods are stacked in a heap



The right stage for harvesting a *Capsularis* jute seed crop

wooden mallets, or by bullocks. Care should be taken to see that the seeds do not get bruised.

The threshing should be done on a clean floor, otherwise the seeds would become dull in colour. The seeds would need cleaning by a hand winnower.

Before finally storing the seeds, expose them to the sun for a few times and then cool them in a shade. If stored when still warm, they are likely to lose viability.

Store the seeds in a damp-proof place. If earthen pots are used, seal their lids. If stored in gunny bags, keep the bags over a damp-free floor. Better use Alkathene-lined bags.

For highest crop yields

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PRAG OIL MILLS

ALIGARH

Vaccination helps you

KEEP RANIKHET OFF

your flocks

by
S.B.V. Rao
Poultry Research Division
Indian Veterinary Research Institute
Izatnagar

TILL as late as 1946, chicken-raising was considered to be most hazardous as flocks were regularly wiped out by the Ranikhet disease, with generally no survivors. Poultry in the villages just managed to live and lay a few eggs in between two attacks of the disease, while large farms never came into existence. But today, thanks to the vaccine produced by the Izatnagar Veterinary Research Institute, poultry-keeping has come to stay as a safe and successful occupation.

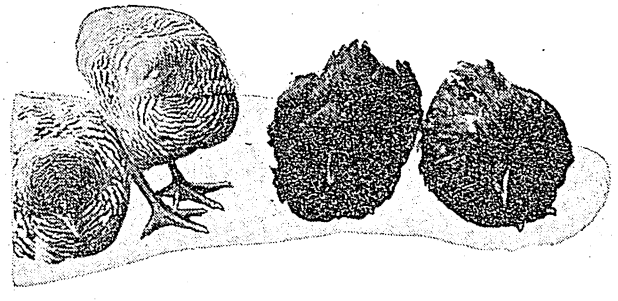
The Ranikhet or the Newcastle disease is a highly infectious and fatal disease of chickens. It is widespread throughout the world, but in a somewhat milder form in the U.S.A. and Canada. The first outbreak of the disease was observed at Ranikhet in the Himalayas in Uttar Pradesh in 1927, and since then it has been causing enormous poultry losses every year. The disease is produced by germs which cannot be seen under a microscope and, therefore, belongs to the virus group. The virus is easily destroyed by exposure to direct sunlight for two to four hours, but is resistant to drought and low temperatures. Contaminated runs remain infective for one to two months, while in the carcasses the virus can survive for a week. A few birds that recover from the disease may become "carriers" of the infection into healthy flocks. The disease has been reported in pigeons, crows and turkeys, while ducks and geese are resistant to it. Man may contract the disease by handling sick birds, the symptoms being cold and conjunctivitis.

TWO FORMS

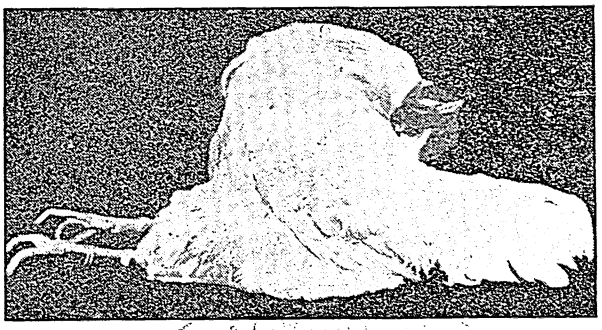
In acute cases, the disease kills birds rapidly, showing few symptoms, and this form is commonly seen in baby chicks. In older birds, it invariably takes a longer course. The period of incubation is from three to seven days, while the course runs from five to ten days.

In subacute cases, the chickens lose their appetite, appear dull and droopy with ruffled feathers, and adopt a crouching attitude with their eyes closed. The temperature ranges from 108.5°F to 110°F. Respiration increases and, at times, there is gasping or whistling inspiration which can be heard over some distance. Great thirst and watery yellow fluid evacuations start two to three days after the initial rise in temperature. The crop is distended with a sour fluid and a stringy mucus dribbles out of the beak. The bird may shake its head to dislodge the mucus from time to time. The comb and wattles may turn blue, the temperature falling with the approach of death.

Village poultry struck with the disease



Ranikhet has given this chicken neck paralysis



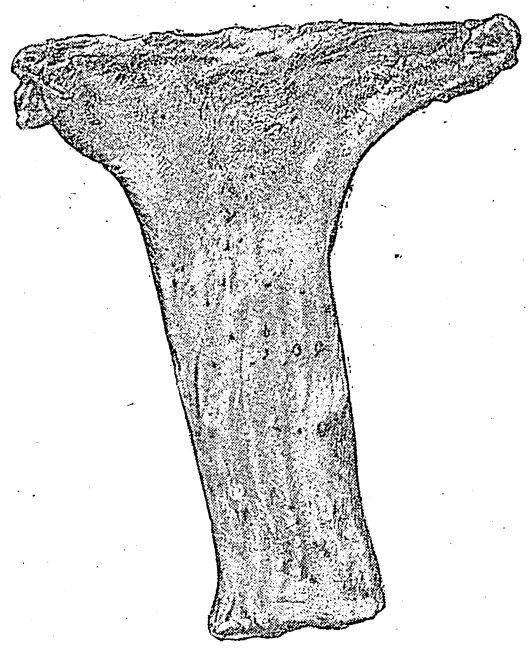
In a small percentage that may recover, paralysis of the wings, the neck or the legs may be seen. A recovered bird may appear normal, though often sterile, but spasms may come from time to time causing it to twist the neck to its back or to the side—a sure sign of the after-effects of the viral infection.

In natural acute cases, no naked eye tissue changes are seen in any part of the body. In others, few or many small scattered red spots appear under the mucus lining of the glandular stomach on the summit of the secreting glands. Ulcerations in irregular patches in the small intestines are also often seen.

LABORATORY DIAGNOSIS

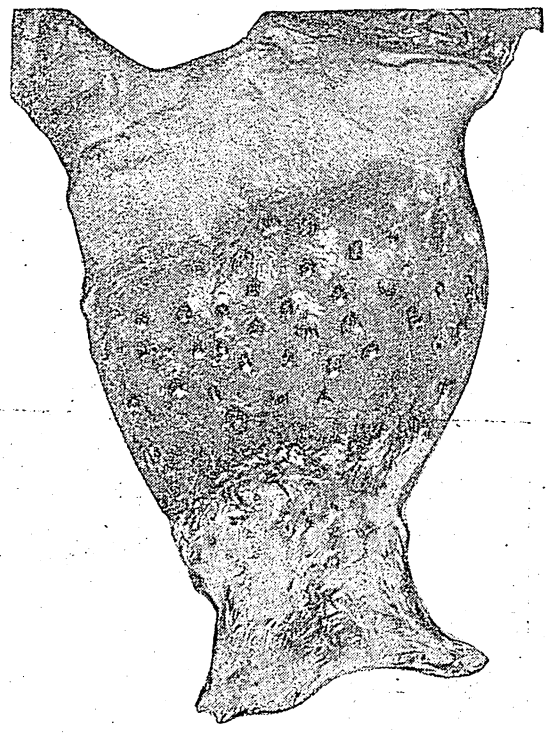
As so many poultry diseases are alike in symptoms with few or no *post mortem* changes in acute cases, a quick laboratory diagnosis is of value. Nowadays, most poultry disease laboratories can give a definite diagnosis within 48 hours by a test known as the Haemagglutination (H.A.) Test. For this, it is necessary that the spleen of the ailing or the freshly dead bird is sent preserved in glycerine and saline (50 : 50) in a thermos on ice.

So far no drug is known to cure the disease, and only prevention is possible. The Izatnagar Institute has evolved a method to harness the virus of the disease by growing it serially in hen eggs and attenuating or weakening it so that it may be used as a "vaccine." This is a live vaccine, but will never cause the disease, and has been used from Coast to Coast in millions of chickens with absolute safety.



. . . ulcers in the small intestines

Two symptoms of a natural acute case: red spots on the lining of the stomach, and. . .



OPTIMUM AGE

The optimum age for vaccination in chickens is six to eight weeks, though older ones may be vaccinated at any age. There would be a temporary fall in the egg yield if layers are inoculated. In mass vaccinations, one to two per cent may react severely and may become paralysed or culls.

The vaccine is too "hot" for brooder chicks below one month of age owing to the severe post-vaccination effects. It has been observed in experiments at the Institute that if this vaccination is done in day-old chicks, one-third get killed, one-third are immunized for variable periods, and the rest miss the protection.

HOW TO GET THE VACCINE

This vaccine is now prepared at most Veterinary Biological Centres in the states and at the Indian Veterinary Research Institute, Izatnagar. It can be had for the small price of Rs. 2-10 for 200 doses in the most easily dispensable form of "freeze-dried ampoules." The vaccine can be obtained through parcel post, without refrigeration, at any place in India. But it must be preserved on ice in a thermos or in a refrigerator if not used immediately on receipt, as it cannot stay potent at the atmospheric temperature for more than a week in our country. Ice cold water is preferable for preparing the vaccine, and once it is reconstituted it should be used the same day, protecting it from the sun and heat during inoculations. Any poultry farmer can protect his flock himself by following closely the instructions enclosed with the vaccine.

Padal, tree of the grasslands

by
M. D. Chaturvedi

OCCURRING throughout the subcontinent of India, the *padal* is particularly met with as an associate of *sal* throughout the sub-Himalayan zone, ascending up to an elevation of 4,000 feet. It is largely confined to the east of Yamuna and avoids the inhospitable dry tracts of western India. In the Deccan plateau, the *padal* is at its best in the moister valleys, although it subsists fairly well elsewhere. It frequents the forests of Central India, and of Chhota Nagpur.

The *padal* is rather a large deciduous tree. Its large leaves (18 inches or so) turn brown in north India around March-April when they begin to fall. Its bark is grey, falling off in large blotches. It is a tree of grasslands and is content with poor soil conditions which obtain along the Siwalik slopes and the Deccan tract. It is often met with in pure patches in clayey soils.

The new leaves appear in May-June. Purplish flowers, yellow underneath, hang in fragrant and hairy pendants from April onwards. Long, cylindrical fruits (average length 18 inches, diameter 3/4 inch) reach their normal size by the end of the rainy season, but are not ripe until the following March when they turn dark grey with raised white specks. The brownish seed inside is small and winged. It is carried long distances by the wind when the fruit opens out on trees. The seed does not keep long.

The *padal* is known by a variety of names: *padal, pandri,* Hindi ; *parul,* Marathi. Its Latin name to the botanists is *Stereospermum suaveolens* (syn. *Bignomia*).

The *padal* seedling looks somewhat like that of teak during the early stages. It grows rather slowly in the beginning.

HOLDS ITS OWN

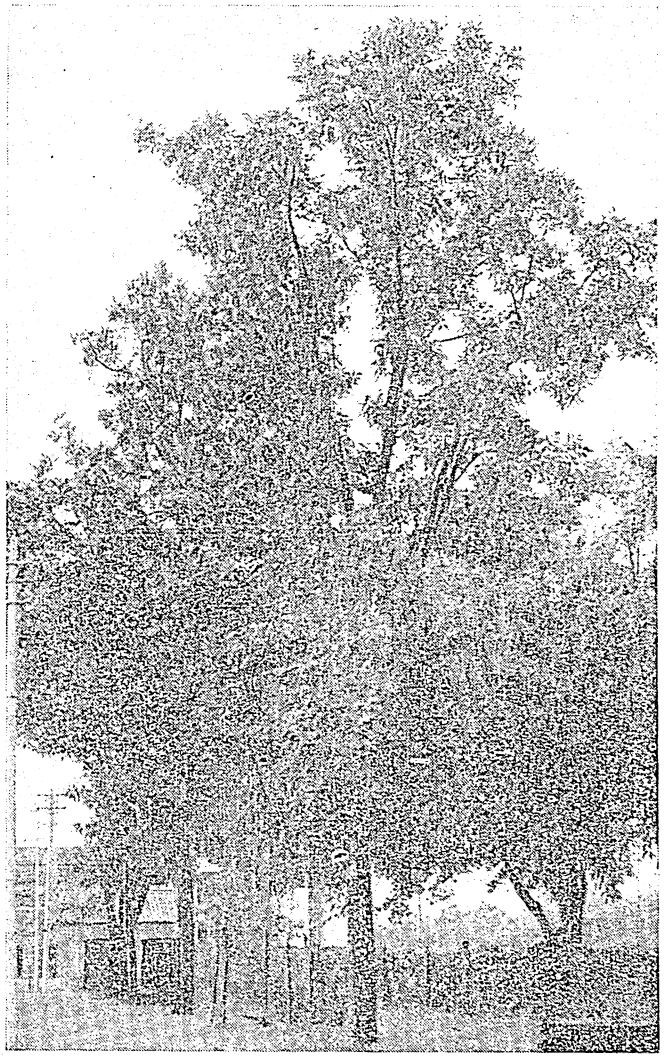
The *padal* plant can hold its own against weed competition. It can stand considerable amount of drought and frost. It is for this reason that the *padal* is found restocking dry hillsides and open grasslands. It can adapt itself to all sorts of soils. The sapling shows remarkable resistance to fire ; killed back by a fire, it shoots up again. It has a good coppicing power.

In Nature, seeds germinate at the break of the monsoon, and young seedlings grow up through the rains establishing themselves by the end of the rains.

The seedlings are easy to raise in nurseries from where they can be transplanted with a ball of earth round their roots without any difficulty. Direct sowings require careful handling.

The *padal* can stand a lot of shade and fends for itself against cattle, but not against goats.

The timber is fairly good; it is hard and the heartwood is beautifully figured. The *padal* comes in handy in afforestation schemes affecting open grasslands and dry tracts with inferior soils.



Britain Enters a New Era of Power Farming

by
Peter Giles

THE development of power take off—whereby the tractor's engine is used to drive subsidiary machinery or implements —and the wider use of two and three-point linkage—whereby a wide range of implements can be operated by the tractor as well as hauled by it—has revolutionized power farming in Britain. Linkage has produced fundamental changes in the design of many farm implements; the exploitation of power take off has mechanized even the subsidiary tasks, traditionally hand-done, of hedging, ditching, and the like.

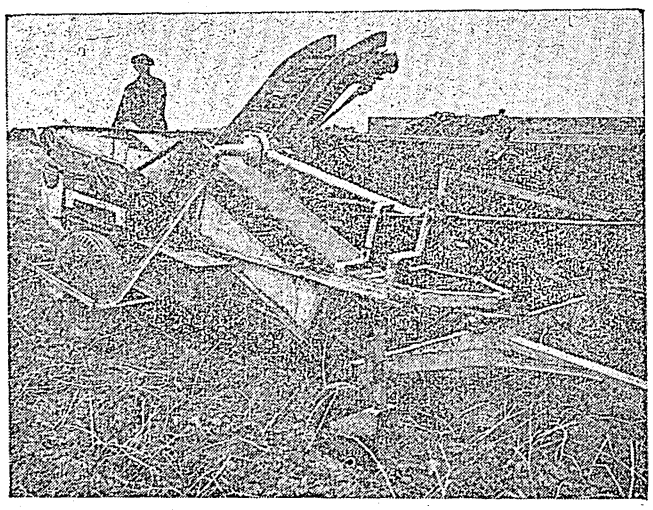
Machinery, linked to and driven by tractors, is now being made to dig ditches, mow grass, lift potatoes, cut hedges, spread lime and manure, saw wood, harvest sugarbeet, mix concrete, compress air, spray crops, dig post holes, bale straw, operate rotary hoes, load trailers and move earth. And these machines are being made to satisfy not only the specialized demands of the farmer in Britain but also of farmers overseas.

FOR IRRIGATION

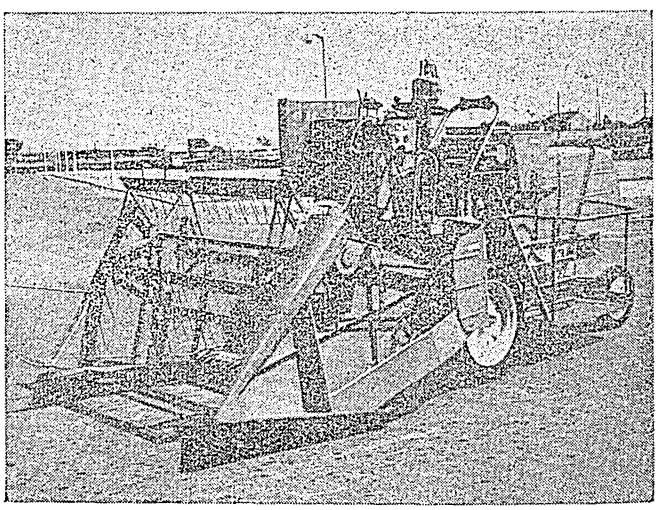
A single example will suffice. For centuries in certain parts of Africa, irrigation ditches in flooded fields have been hand-dug, but dug to a certain definite depth and shape —so that flood waters shall be retained on the fields to deposit silt, but in draining away shall seep through the ground slowly enough to leach salt and soda deposits out of the soil. Long experience has shown which is the best shape of ditch for this purpose. Now an Essex (England) company has produced a bucket attachment to what it calls its "Dinkum Digger" which will carry out this ditching task for the farmer accurately and automatically by machine.

New tractor-driven loaders appear on the market in Britain every month. Among them has been that made by an Isleworth, Middlesex (England) firm for the "Fordson Major." It is a front end loader with two lifting rams, a double-action ram for tilting the buckets, and a maximum lifting capacity of one and three quarter tons. The Manless bale loader, made by another manufacturer, does its work by hydraulic action as the tractor moves forward—a couple of arms on

Potato-digger that does the work of twenty men



An automatic harvester combine



the side of the tractor grip the sides of the bale as it rests on the ground and swing it backwards to the man on the trailer.

Yet a third loader, which works directly off the driving wheels of any low-geared tractor, is that made by a Devonshire (England) company. The loader is in the form of a frame which has buckets or tines at one end and is bolted directly on to the driving wheel hubs at the other. The loader picks up from the front of the tractor and then, as the tractor backs, so does the frame move round like an extended spoke, raising the loaded bucket or tines above and behind the driver's seat. Its further movement is stopped there by two legs attached to the frame which come in contact with the ground when the loader is in the right tipping position.

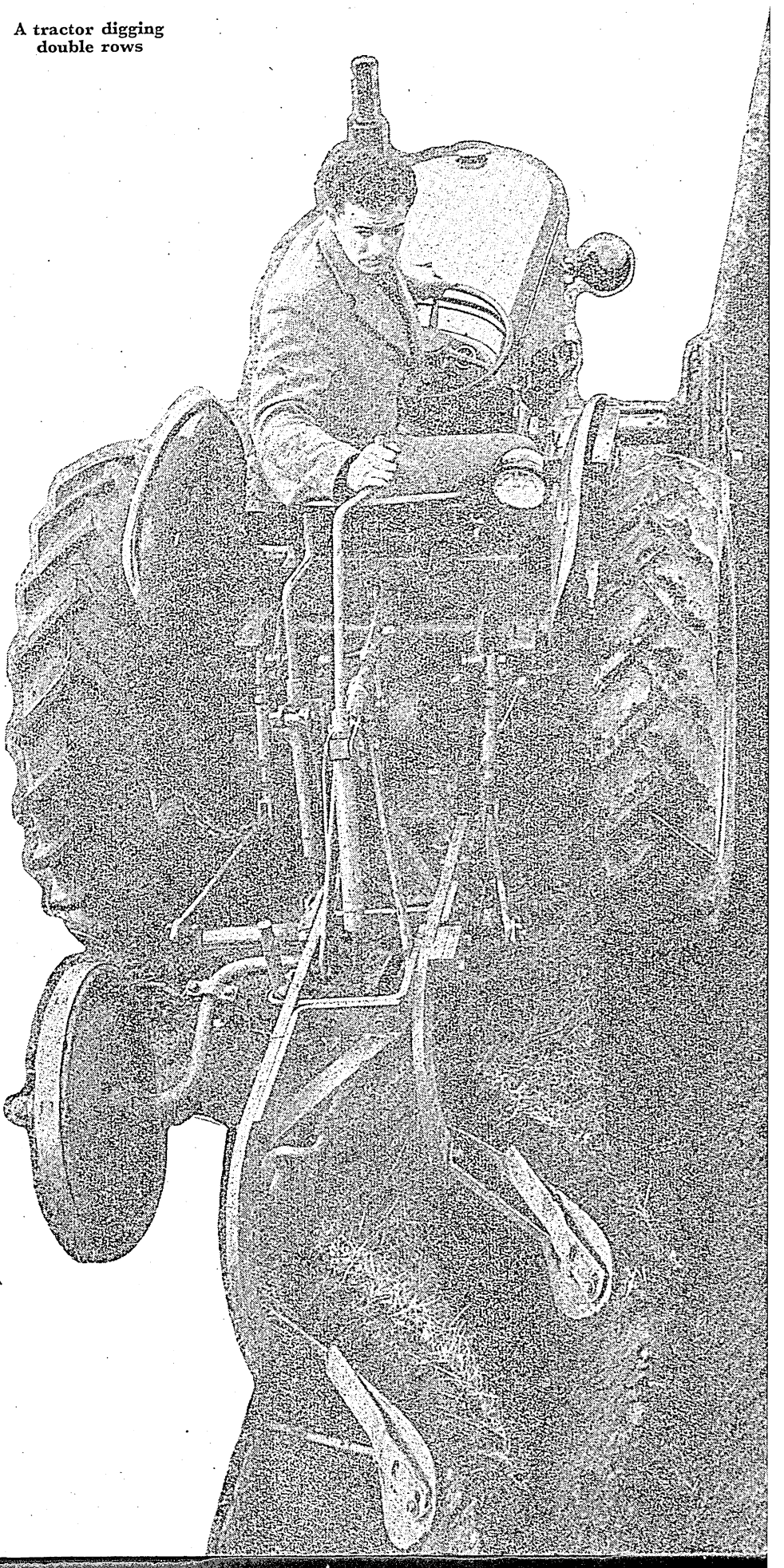
HYDRAULICALLY OPERATED

All these loaders have been designed to be worked by tractor and can operate in no other way.

Ditchers and hedge cutters are being produced in similar numbers. One ditcher among the many recently developed in Britain is the "Landrainer." It is towed behind the tractor like any other trailed equipment and cuts new ditches while maintaining the

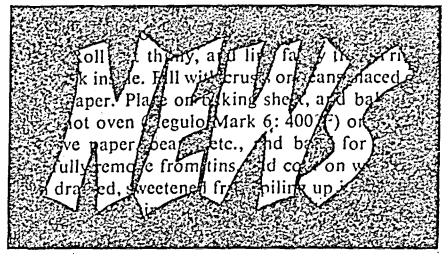
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A tractor digging double rows





Public planting of Gliricidia by prominent persons enlisted popular enthusiasm



Gliricidia Week

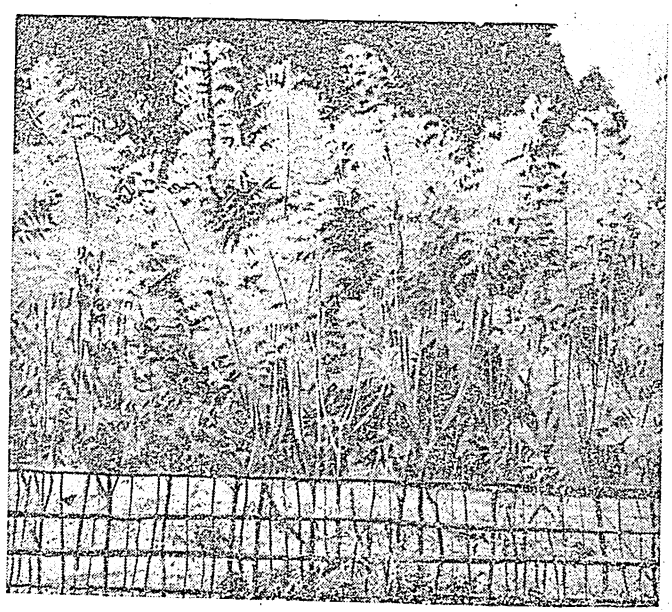
MORE than a crore of Gliricidia were planted during the "Gliricidia Week" recently organized in Kerala State. The Week which formed part of the drive to make the Kerala farmer green manure-minded, turned out to be a great success, and the target of planting one crore seedlings was easily exceeded.

Green manuring is perhaps the cheapest way of adding fertility to the land and Kerala paddy lands are in need of it. Gliricidia was selected because it grows quickly, produces abundant green material and stands lopping very well. It does not require any special land and grows with ease over boundaries of house compounds, roadsides, etc., thus providing protection as well as valuable manure.

Seedlings were raised in large numbers for distribution



Gliricidia makes an excellent fence



PICTURES

This is, however, only a beginning. Kerala needs at least 26.6 crores of Gliricidia to meet the needs of her paddy fields and coconuts. A 100 Gliricidia for an acre of paddy and one for every coconut is the ultimate target. It will need much more than one campaign to achieve this.—*R. Hali* and *Ravivarma*

Dusting From The Air

ABOUT 6,370 acres of paddy in Bara Banki, Sitapur, Lakhimpur and Sultanpur districts of Uttar Pradesh were recently dusted from the air, perhaps for the first time in India, as the crop was feared to be heavily infested with the *gundhy* bung. The operation was undertaken by the Directorate of Plant Protection, Quarantine and Storage of the Government of India.

In each flight of about an hour, the aeroplane dusted a 1,000 to 1,200 pounds of BHC dust over 200 to 250 acres. A total of about a 1,000 acres was covered per day.

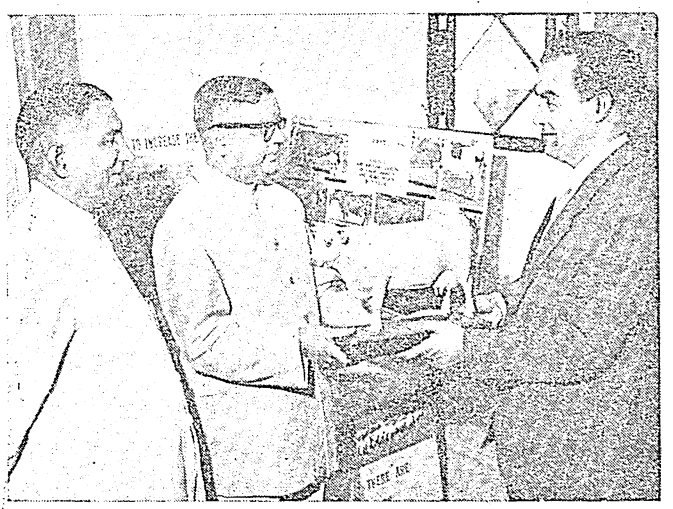
Aerial dusting was found more feasible than ground dusting because of water standing in the fields; moreover, fields dusted from the air have no danger of reinfestation by the pest unlike those dusted with ground equipment by individual farmers. It was observed that the crop areas which were dusted from the air were completely free from the pest the following day, but areas which could not be dusted from the air due to the presence of trees or other obstacles, were infested with one to three *gundhy* bugs per earhead. These areas were, however, subsequently dusted from the ground.

Gliricidia in flower



Exhibits Presented

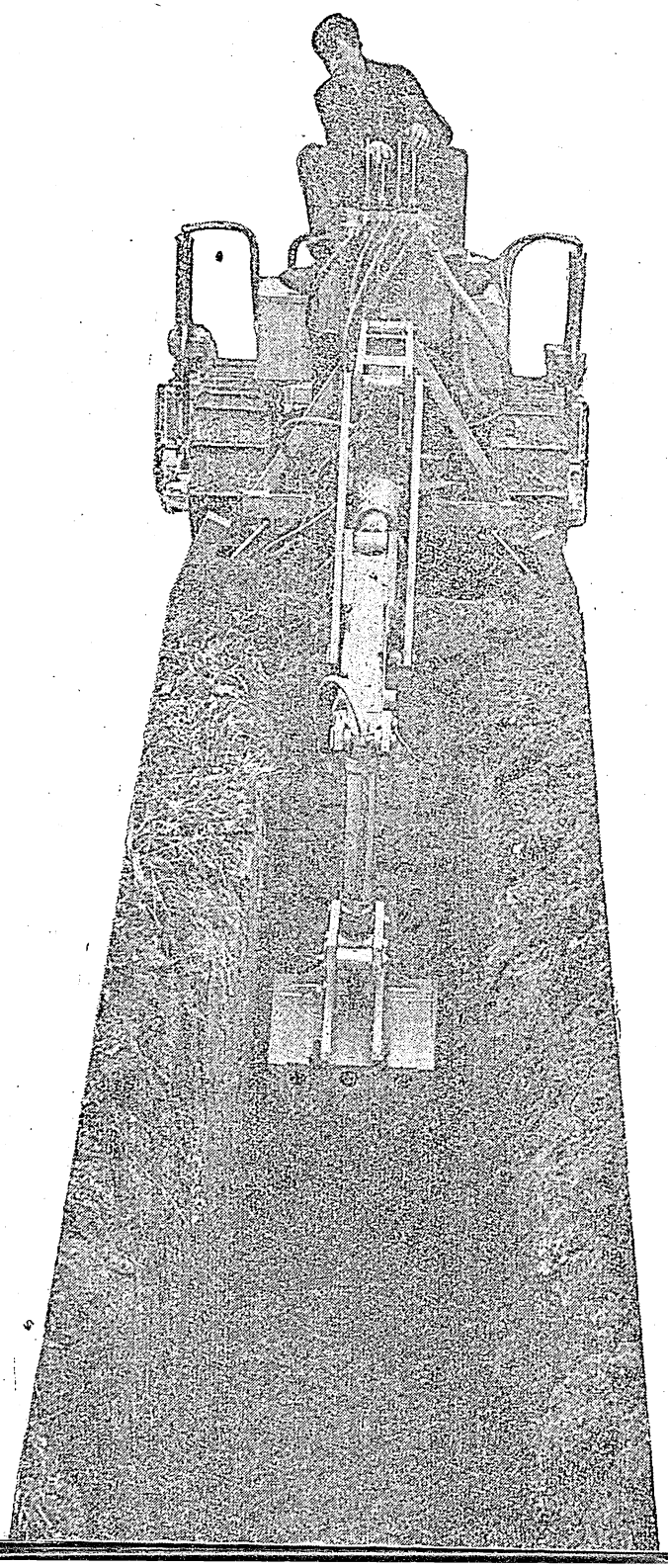
Dr. David V. Ter-Avanesyan, Counsellor for Agricultural Affairs, USSR Embassy in India (*right*), presenting a model of a Russian cow to Shri L. Sahai, Animal Husbandry Commissioner with the Government of India. Dr. David presented a number of interesting exhibits of the Soviet pavilion at the All-India Cattle and Poultry Show held recently in Delhi.



existing ones. All operations are done hydraulically by seven heavy duty rams controlled from a bank of levers mounted on the machine.

One hedge cutter, and again only one of a number of them recently on the market, is that made by a Newcastle-on-Tyne company. Tractor-driven, it has a telescopic arm extending from six feet to eight feet nine inches and its cutter, which cuts vertically, horizontally or at an angle, is said to be powerful enough to cut through a ten to 15 years' hedge growth or saw through trunks up to 18 inches thick.

Irrigation channels being made by a digger attached to a tractor



MID-MOUNTED IMPLEMENT TRACTOR

While the greatest advances in British power farming have, therefore, been in the development of what might even be called a new farming instrument—the tractor and implement integrated with it—there have been certain other interesting individual developments. One has been the production of a new mid-mounted implement tractor, the two-cylinder air-cooled diesel engine of which is rear-mounted and whose implements are raised or lowered by compressed air. Others include new hand power tools, in particular chain saws of all sizes; and the production of two light aircraft both specifically designed for topdressing in ranching country.

Agriculture and agricultural engineering are thriving industries in Britain today. It is hardly surprising if Britain is able to supply not only all the specialized tools her own farmers require but also a wide range of implements for specialized needs the world over.

Contd. from page 9

cotton (*M.A.S.* variety)—746 pounds ; *jola* fodder —21,744 pounds; horse gram—540 pounds.

Under the farm improvement scheme, papayas and plantains were also tried. Excellent crops were raised.

Following is an account of the profits from the farm during the last five years.

Year	*Profit Rs.*
1953-54	43,921
1954-55	38,658.
1955-56	50,658
1956-57	32,645
1957-58	31,806

It is clear that the farm is quite remunerative.

The future programme of development of the farm envisages planting of more coconuts and improving the old grass area. In addition, 5,000 casuarina plants will be planted over an area of 12 acres. Thus, by the end of the Second Five Year Plan, a variety of crops would be growing on the farm. The revenue by then is expected to go up to Rs. 1½ lakhs.

A new extension is also contemplated with the provision of underground drainage to serve a population of 82,200. This sewage will flow towards the northern outfall. The primary treatment works have been constructed. The sewage discharge is expected to be 2½ million gallons per day by 1961-62. This could very well irrigate another 250 acres.

If You Have To Hold Large Gur Stocks...

by

N. C. Varma, K. H. Rao and G. M. Nigam

National Sugar Institute
Kanpur

EXPERIMENTS to find out conditions under which large quantities of *gur* could be stored for long periods without deterioration have led to the designing of a special type of godown.

The godown that has been designed can hold 3,000 maunds of *gur*. However, if a larger quantity of *gur*, say 6,000 or 9,000 maunds has to be stored necessary changes in the size of the godown can be made.

The main feature of the godown is that the gur *is stored on a central framework out of contact either with the ground floor or with the side walls.*

The framework of the godown consists of 12 chambers, each about eight feet × 8½ feet and seven feet high. The platform of each chamber consists of several stretchers made of dried three-inch diameter bamboos. Each chamber is covered by partitions on three sides which again may be made by tying several bamboo stretchers. These side partitions act as supporting walls for the stored *gur* blocks or bags.

The walls of the godown are constructed with clay mortar and painted with lime and *surkhi*. Where clay is not fit for mortar purposes, the brickwork as well as the painting will have to be in lime and *surkhi*. Cement may be avoided.

No ground water or water from the roof should find an access into the godown. It is essential to ward off moisture from the inside atmosphere of the godown as far as possible, because it is primarily the moisture which affects the keeping quality of *gur*. Seepage of moisture through the foundation wall can be avoided by applying a damp-proof course on the foundation of the godown at the floor level, i.e., from the level from which the walls are raised. This damp-proof course may consist of a special quality of cement such as "Pudlo" or "Composeal." Construct the floor of the godown as follows.

(a) After excavation, put bricks on edge over the whole floor surface;
(b) then, a layer of lime-concrete well rammed to a six-inch thickness;
(c) then, a 1½-inch layer of "Pudlo" cement; and
(d) finally, a thick layer of asphalt or macadam or Malthoid which should be covered with bamboo matting.

Construct the roof of the godown with corrugated galvanized iron sheets (not cement asbestos sheets), the overlaps between the two sheets being such that no rain water or moisture can get into the godown through the clearances. To make bolt holes in the G.I. sheets, use leak-proof bitumen washers. After tightening the bolts, fill the clearances between the overlaps with thick asphalt to make the roof entirely air and water-tight. Provide a gutter of ample capacity to drain off rain water from the roof through a number of drain pipes.

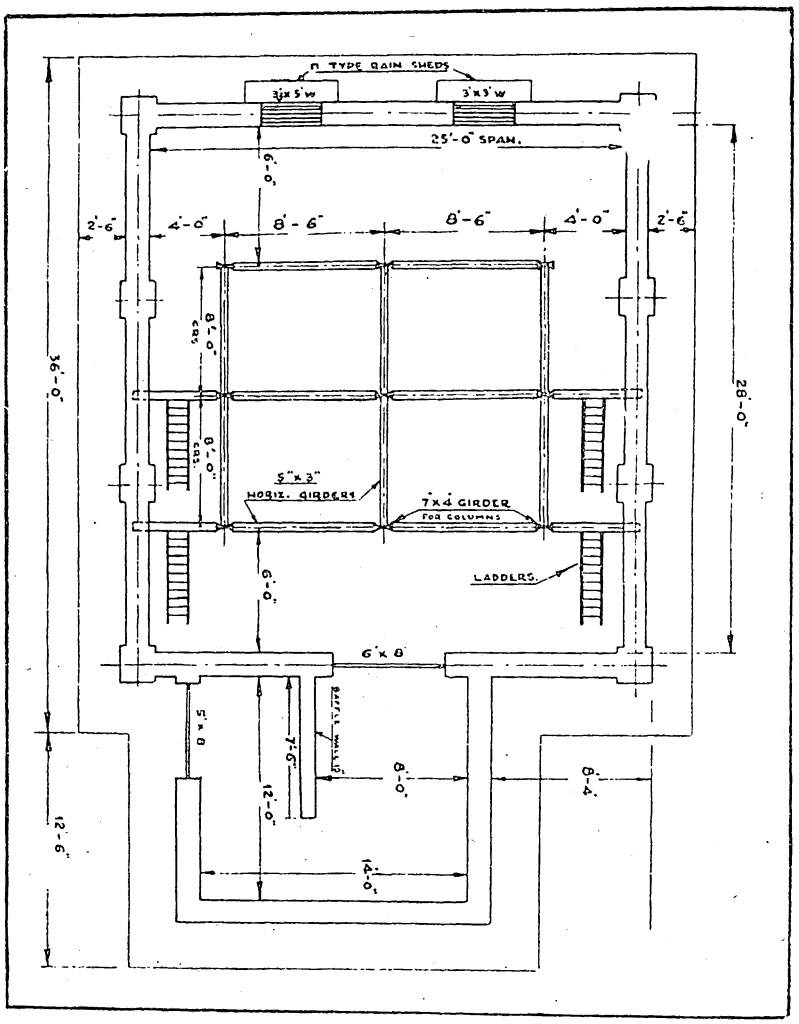
Coat the inside and outside walls of the godown with asphalt. The inside coating should be thicker, up to a level of six to eight feet.

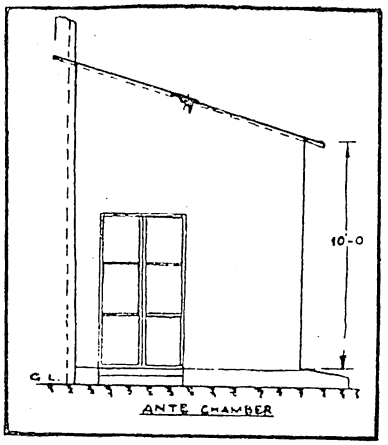
DOUBLE DOORS

Double doors have been provided in the godown with a view to preventing outside air from entering the godown whenever it is opened for storing or for taking out *gur*. Only the outside door should be opened and closed again from inside before opening the main godown door. The reverse practice should be observed while coming out of the godown.

A minimum number of windows and ventilators has been provided. When the rainy season is about to set in or the atmospheric humidity begins to rise, all windows and ventilators have to be tightly closed so that no outside air can enter the godown. For lighting the godown, electric bulbs may be fitted on the roof trusses wherever electricity is available ; otherwise "Petromax" gas lamps or lanterns can be used.

It will be very desirable to open all the windows, ventilators and doors during the hot dry days of summer, and work the exhaust fans for a few days, so that the inside humid air is replaced by hot dry air from outside. As soon as this operation is complete, the windows and





SPECIFICATIONS OF THE NEW *GUR* GODOWN

1. Span 25 ft., length 28 ft. and height 22 ft.; area 700 sq. ft.

2. The main door 6 ft.×8 ft. within an antecnamber having an entrance of 5 ft.×8 ft. and a ten-inch thick baffle wall in between the entries to guard against direct entry of humid air. The antechamber has a separate G.I.C. sheet roofing fixed on a 2½-in.×2½-in.×5/16 inch angle-iron frame.

3. Four ventilators 2 ft. 6 in.×3 ft. 6 in., with a ¼ in. thick perpex sheet pane fixed and protected by a barricade of closely spaced ⅝ in. M.S. bars provided for light ; two on the front and two on the back wall at a height of 23 ft.

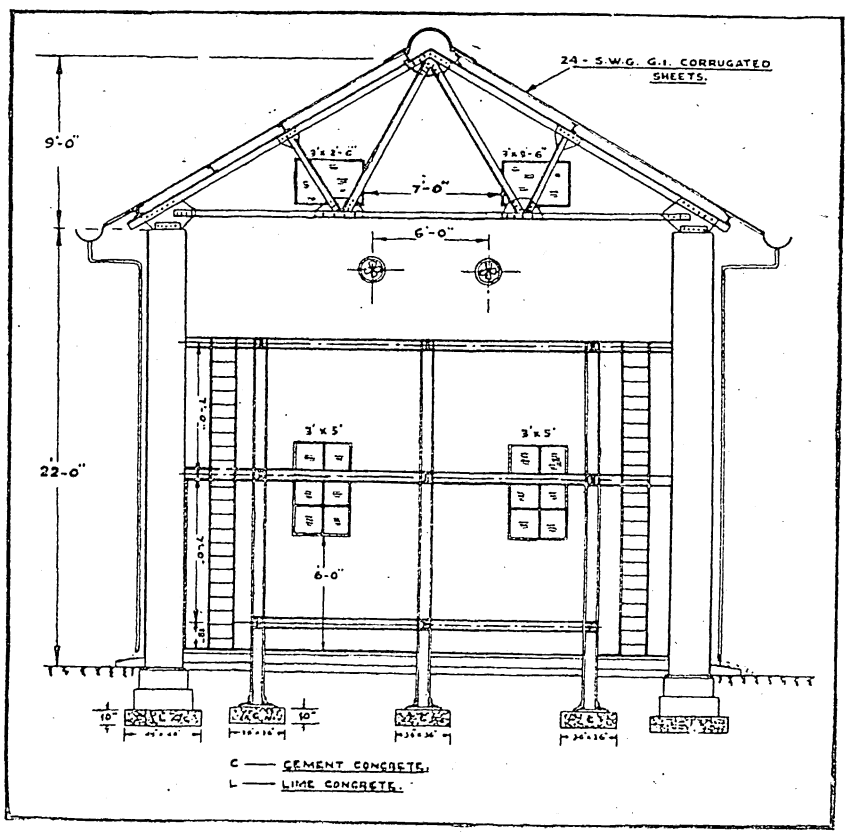
4. Two windows 3 ft.×5 ft. glazed inside and barricaded outside by ⅝ in. M.S. bars on the back wall at a height of 6 ft.; window rain shades projecting out 18 in. and capable of being closed air-tight.

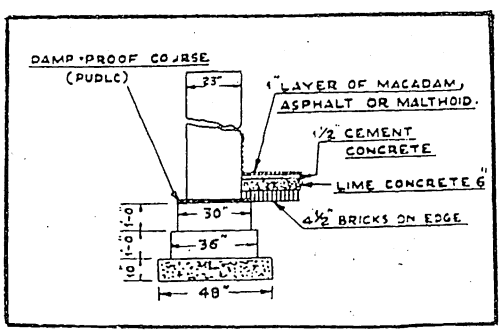
5. Two 16-in. sweep exhaust fans fitted on the front wall at a height of 17 ft. where power is available, provided with air-tight covers and having semicircular rain shades.

6. The platform of each chamber of bamboo stretchers (with 3-in. diameter dried bamboos), each chamber having bamboo frame partitions on three sides.

7. The godown to face north to allow sun-heating to the maximum wall area.

8. Four ladders, two for reaching the first floor and two for the top floor on both the sides of the storage chambers.





ventilators and the openings of the exhaust fans should be tightly closed.

DEHUMIDIFICATION

In regions where high humidity conditions exist and where electricity is available, electric dehumidifiers can be installed inside the godown at each corner. These will absorb the moisture from the inside atmosphere, and the absorbed water can be drained out. Alternatively, several trays containing silica gel or quicklime can be kept on the ground floor. When the silica gel has absorbed moisture and become saturated with water, it can be heated to dryness and reused. The quicklime has to be changed as soon as it crumbles to powder.

In the experiments, the following seven varieties of *gur*, totalling about 125 maunds, were purchased from the Kanpur market in the month of June and packed and stored differently in the godown of the Experimental Sugar Factory of the National Sugar Institute, Kanpur, to study their behaviour.

Description and form of gur		*Packing*	*Approximate weight of each bag or block*	*Total weight* Md. sr. ch.
Chaku	Flat slab lumps about two inches × three inches in size	Packed in Hessian bags	One maund	14-20-12
Pari (*Chait*)	Blocks of the shape of an inverted bucket	Blocks covered with Hessian cloth and stitched	25 seers	10-2-12
Pari (*Chait*)	do.	Open blocks	35 seers	22-0-0
Pari (*Magh*)	do.	do.	do.	18-2-12
Khurpa	Lumps of the shape of a small bun about three inches in diameter and ellipsoidical	Packed in Hessian bags	do.	19-26-8
Laddoos	Balls two to 2½ inches in diameter	do.	One maund	20-8-4
Panseras	Blocks of the shape of a Fez cap	Packed in Hessian bags	Five seers (block) and one maund ten seers (bag)	19-16-4

The *gur* varieties were kept in this godown before the monsoon started. The method of stacking the *gur* samples in the godown was as below.

1. *Chaku* Lot No. 1 — Five bags kept one over the other
2. *Chaku* Lot No. 2 — Bags removed and contents kept in drums with their mouths closed
3. *Chaku* Lot No. 3 — Six bags kept one over the other
4. *Pari* (*Chait*) Lot No. 1 — With stitched Hessian cloth covering, five *paris* kept one over the other and under wheat husk
5. *Pari* (*Chait*) Lot No. 1 — Removed the Hessian cloth of two, *paris* broken to pieces and kept in drums
6. *Pari* (*Chait*) Lot No. 3 — With stitched Hessian cloth covering, four *paris* kept one over the other
7. *Pari* (*Chait*) Lot No. 1 — Open *paris*, four in the bottom layer, three in the next layer, two in the next layer, two in the next and one on the top, covered all round with wheat husk
8. *Pari* (*Chait*) Lot No. 2 — Four *paris* broken into pieces and kept in drums
9. *Pari* (*Chait*) Lot No. 3 — Open *paris*, four in the bottom layer, three in the next, two in the next, two in the next and one on the top covered all round with wheat husk
10. *Pari* (*Magh*) Lot No. 1 — Nine *paris* kept open one over the other, in three layers
11. *Pari* (*Magh*) Lot No. 2 — Four *paris* broken and kept in drums
12. *Pari* (*Magh*) Lot No. 3 — Nine *paris* kept open one over the other, in three layers
13. *Khurpa* Lot No. 1 — Nine bags, in four layers of two each with one bag on the top
14. *Khurpa* Lot No. 2 — Two bags emptied into drums
15. *Khurpa* Lot No. 3 — Nine bags, in four layers of two each with one bag on the top
16. *Laddoos* Lot No. 1 — Eight bags, in four layers of two each, and covered under wheat husk

17.	*Laddoos* Lot No. 2	Two bags emptied into drums
18.	*Laddoos* Lot No. 3	Eight bags, in four layers of two each, kept open
19.	*Pansera* Lot No. 1	Seven bags, in three layers of two each, and one on the top kept open
20.	*Pansera* Lot No. 2	Contents of two bags broken and kept in drums
21.	*Pansera* Lot No. 3	Seven bags, three layers of two each and one on the top kept open

A sample from each lot of the different varieties was then drawn before the start of the monsoon, i.e., between the third and fourth weeks of June, thoroughly mixed separately in a closed room which was previously dehumidified, and preserved in a two-pound glass jar and sealed with wax. The physical condition of every lot of each variety was noted down at the time of drawing samples both before and after the monsoon. Whenever the samples were drawn, both the doors of the godown were kept closed. The second set of samples of each variety was taken in the month of November, i.e., after the monsoon.

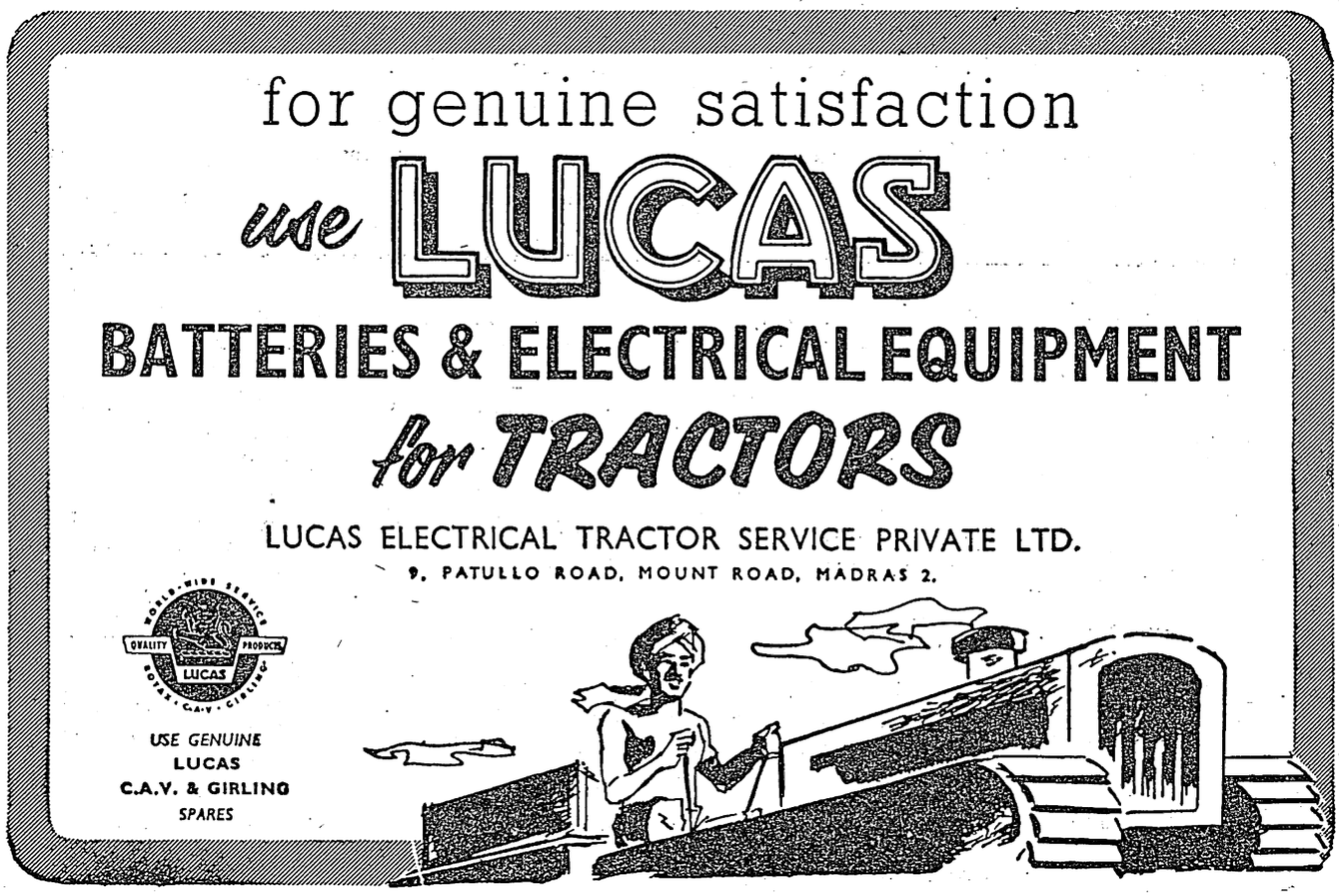
To find out the extent of deterioration during storage, the samples were analysed for the following constituent-percentage before the monsoon as well as after the monsoon: soluble solids, Pol., sucrose, invert sugar, moisture and ash.

HUMIDITY

The relative humidity in the godown varied considerably in the month of July, going as high as 87. Very often, it remained at 75. In the last week of July, however, it remained at a lower level, going as low as 68. In August, it was near about 80. In the last three days of August, it came down to 70 to 74. In September, the variation was again considerable, mostly between 80 and 86. In October, it remained practically steady at about 80, and in November, it came down to about 75.

It may be pointed out that the relative humidity inside the godown, which is more or less closed from all sides and in which a material containing moisture has been stored, must be different from the atmospheric humidity outside, and is a combined function of the humidity outside and the moisture reserve inside the godown. The humidity of the godown tends to come to an equilibrium with the moisture content of the material stored.

It will appear from the data that the conditions under which the *gur* remained in storage during the period of experiment, corresponded to humidities between 70 and 86.



MOISTURE IN *GUR*

Initially, the *gur* samples had varying moisture contents, from about four per cent to about 11 per cent, but after storage the moisture content was within the limits of 7.05 and 9.5 per cent, i.e., round about eight per cent. Those samples that initially had four or five per cent moisture, absorbed more moisture, i.e., up to about eight per cent, while those samples that initially had about 11 per cent moisture tended to come down to nearly eight per cent. Those samples that initially had a moisture content of near about eight per cent continued to have near about the same value, neither absorbing nor losing any moisture.

This shows that the moisture in *gur* and the humidity of the godown tended to attain a certain level of equilibrium which in our case corresponded to a moisture content in *gur* of about eight per cent.

SUCROSE CONTENT

The sucrose content of the different samples varied from about 68 to 84 per cent. Six samples of *gur* were of inferior quality, having a sucrose content between 68 and 72 per cent, five samples were of medium quality, having a sucrose content between 73 and 76 per cent, seven samples were of good quality, with a sucrose content between 77 and 80 per cent, and three samples were of very good quality, having a sucrose content between 81 and 84 per cent. Except for seven samples (2, 6, 9, 10,12,13, and 18) whose composition appears to have differed in their homogeneity when their samples were drawn (and in a complex substance like *gur* this is very likely to happen) all the other samples more or less went down in sucrose content which was to be expected. The loss in sucrose content was more or less between 3.5 and 6.5 per cent. The extent of deterioration was, therefore, not much.

OUTWARD APPEARANCE

All samples of *gur* in general, irrespective of their quality, kept quite well. The samples which were kept in drums appeared to have undergone the least deterioration. Those that were covered with wheat husk were comparatively better than those that were kept open. In the case of the sample 9, which was kept near the entrance door, the deterioration was considerable. Samples 10 and 12 were appreciably moist initially and became worse in keeping.

Except for three lots, one of which was kept near the entrance door and two others which were initially moist, all samples kept reasonably well in the sugar godown. It would be safer still to keep the *gur* on a layer of dry wheat or paddy husk and cover it all round with husk, provided the *gur* is in gunny bags or Hessian packing. If it has no packing, the best method would be to spread Hessian cloth over a four-inch layer of dry wheat husk, paddy husk or cotton seed, and stack the *gur* on it.

Because the experiments were started late, i.e., when the monsoon had just set in, the initial desiccation or drying of the *gur* by means of the hot dry air sucked through the godown by an exhaust fan could not be tried, but it may be said that if after stacking the *gur* in the godown the inside air of the godown is exhausted during hot dry days, as in April and May, for about a week (during daytime only), the *gur* would be desiccated and deterioration would be negligible, if at all.

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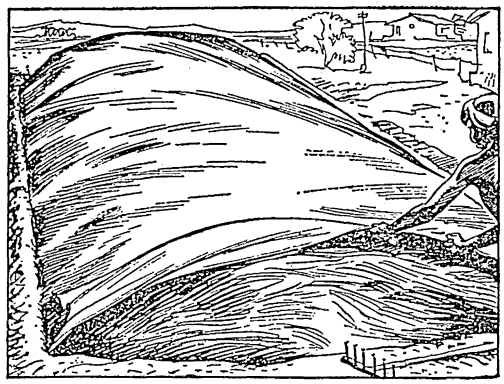
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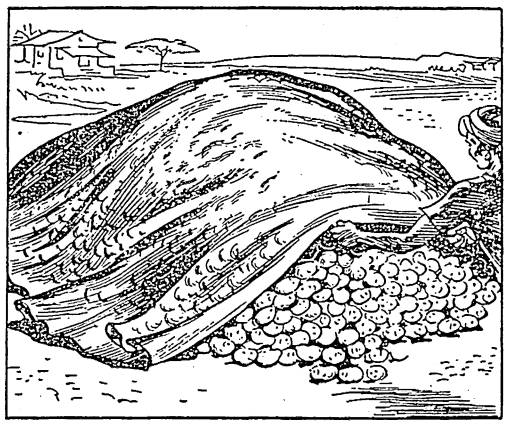
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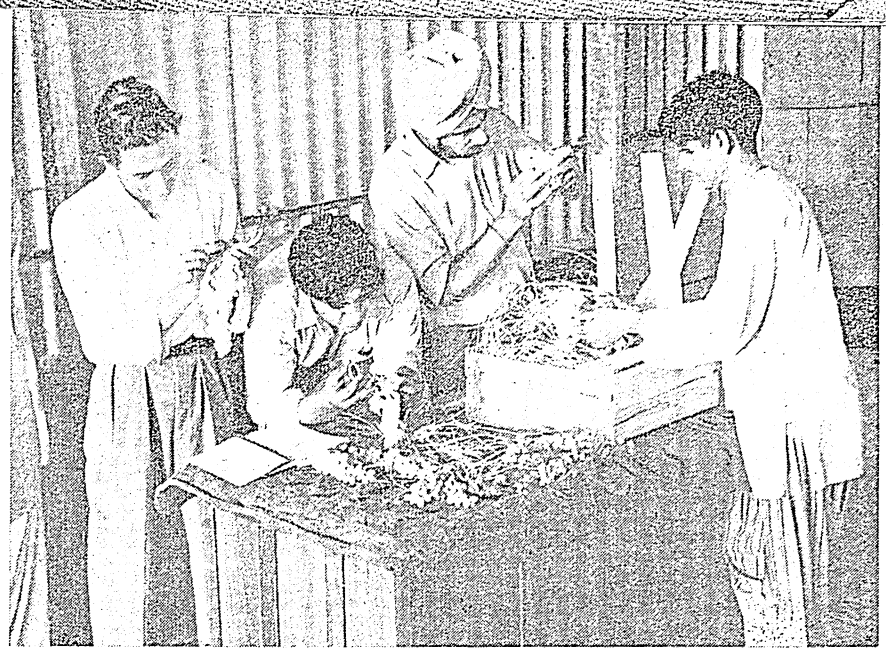
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Grapes imported from Afghanistan being examined after fumigation at the Fumigation Centre, Amritsar

Needed: Effective Ways of Controlling Pests and Diseases

by

K. B. Lal

Plant Protection Adviser to the Government of India
New Dehli

EVER since crops began to be cultivated, pests and diseases have been damaging them. Investigations carried out in all parts of the world, including India, over the last 50 years or more, have highlighted the enormity of such damage. On a conservative estimate, five to ten per cent of the standing crops and stored produce,valued at about 600 crores of rupees, are lost every year in India in this way. One of the main conclusions of the Indian Famine Enquiry Commission of 1945 was that "If the full benefits of irrigation, manuring and improved varieties are to be assured, effective action must be taken to deal with diseases, pests, vermins and weeds." The Commission, therefore, considered that crop protection was an important factor in increasing production, and recommended that special plant protection staff should be employed in every state for this particular purpose.

However, before plant protection or any other staff can prevent damage by pests and diseases in the field and in the storage godowns, the necessary measures for this purpose must be known. And therein lies the need for research on pests and diseases.

RESEARCH

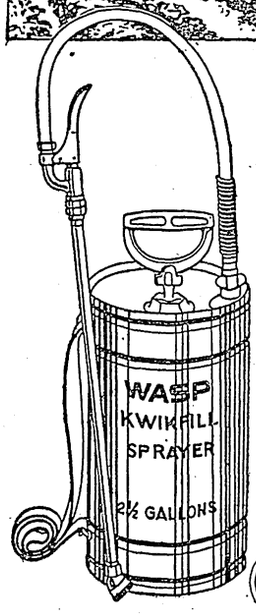
Of about 250 insect and other animal pests, 150 diseases and 30 to 40 weeds that depress crop-yields and deteriorate the quality of the produce many have been under investigation in India with varying degrees of success. The organizations engaged in this task have been the State Departments of agriculture, the research institutes of the Government of India and, in some cases, the universities and a few private institutions. The Indian Council of Agricultural Research and the various Central Commodity Committees have provided financial assistance for the purpose. As a result, a considerable mass of information and data have been available for utilization.

Research work in other countries also has helped India considerably to understand pestsand diseases better and to develop control techniques against them. The electron

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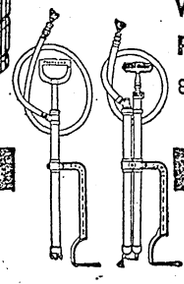
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microscope, invented more than 20 years ago and subsequently improved, has been one of the most potent factors in revealing the nature of viruses which are responsible for a host of infectious diseases not only in plants but also in animals and human beings. Since the end of the last World War, a large number and variety of synthetic chemicals have been developed for use as insecticides, fungicides, weed-killers, rat poisons and for such other purposes. These are now being commonly used practically the world over, including India.

Considerable research has been conducted in India on locusts, initiated by the Indian Council of Agricultural Research in 1931 and now being continued under the Directorate of Plant Protection, Quarantine and Storage at its Field Station at Bikaner, since 1957. While the broad methods of locust control are known, many points in the biology and ecology of the pest and the dynamics of its population trends are still obscure and the control techniques still need development and improvement in many directions.

THE CATERPILLAR GROUP

The group of caterpillars, which bore into the stems of paddy, maize, millets and sugarcane, have assumed great importance because of the urgent need to increase the production of food crops and sugarcane. Being mostly internal feeders, it is not easy to get at them by means of insecticidal sprays and dusts and the precise timings of such applications against them must demand not only a thorough knowledge of their life and seasonal histories, habits and behaviour but also an organization capable of assisting farmers in the timely and correct application of the measures required.

The group of fruit-sucking moths, which cause considerable damage to growing citrus fruits, still require investigations to control them effectively. Likewise, fruit flies, whose maggots enter into mango, guava, apple, peach, pear and other fruits, are not easy to control by our known methods. Flying foxes, which damage growing guava, apple, pear and other fruits in Delhi, Himachal Pradesh, Punjab and other areas, have created a problem. The solution has been sought in blasting operations by means of gelignite bombs on trees on which the animals roost.

The late blight of the potato crop s a disease, common in north India, which has found favourable conditions for survival during summer as a result of the practice of storing potato tubers in cold storage. On the other hand, the cold storage eliminates the potato tuber moth pest which causes damage to stored potatoes.

There is nothing very satisfactory known against wheat and barley rusts beyond the evolution of varieties resistant to them.

OPERATIONAL RESEARCH

In most cases, the results of research can be successfully utilized only after they have been tested and tried in the field. In the case of chemical methods, the effectiveness of pesticides has to be tested with regard to their concentrations, dosages per acre or per tree, times of application, phyto-toxic action, residual toxicity to crops, soils, animals and human beings and toxic hazards involved in their use against various pests and diseases under various conditions.

Likewise, in employing the biological method, investigations must first be conducted to determine suitable times and techniques of mass liberation of parasites or predators of any pest it is desired to control.

The use of pesticides mostly necessitates the employment of spraying, dusting and seed-dressing machines, whose efficiency and suitability make a big difference to the success of control operations. Their field performance also must, therefore, be tested before they may be effectively employed with the greatest advantage.

Lastly, investigations must constantly be conducted to determine the results of control operations over selected crops and other areas in terms of pest mortality, reductions in the incidences of pest and disease infections, improvements in crop growth and increases in crop-yields.

WHY NECESSARY

Such assessments are necessary not only to evaluate the results of individual control operations but also to compare the relative efficiency of different operations or even methods of control employed. Such essential investigations, required before and after control operations, have often been termed "operational research" or "field investigations."

BETTER CHANCES

In India, field investigations have been conducted largely by the State plant protection organizations, the Directorate of Plant Protection, Quarantine and Storage and some research institutes, notably those connected with sugarcane. As a result, concentrations and dosages of various modern pesticides for various pests, diseases and crops have been fixed and refixed and the field performance of a large variety of spraying and dusting machines, operated by hand, foot or power, on different crops has been assessed so that recommendations for control techniques and appliances are now being made with greater confidence and chances of success than before.

Information and experience have also been gained regarding the residual effects, phyto-toxic action and toxic hazards of various pesticides. No work has, however, been done on the accumulative effects of pesticidal residues on crop produce or soil fertility, though considerable information on these two subjects is available from the results of work carried out in other countries.

There has been evidence that the continued use of pesticides has led to resistances in certain insect pests, which have failed to be killed by them after a time. No such authentic case has come to light in India and it has not been clear whether the few suspected cases, for example, the inability of five per cent BHC dust to control the *singhara* beetle, have been due to such newly developed resistances or to deteriorated pesticides or faulty application. It has been experienced, however; that the application of DDT against a pest has led to the appearance of other pests, notably aphids, due presumably to the simultaneous destruction of beneficial insects that were keeping the other pests in check.

It appears, therefore, that, while research on the basic aspects of pests and diseases and the methods of their control must continue, it is equally, if not more, essential that field investigations on them must also be encouraged and continued so as to utilize fully the results of the basic research. Research in our agricultural institutions can be fruitful to the extent it is directed towards finding out practical remedies against pests and diseases instead of digressing into channels of academic interest, which should be the function of universities and such other organizations concerned with finding out scientific truths and not necessarily with their practical applications.

WORLD AGRICULTURE FAIR

New Delhi will be the venue of the First World Agriculture Fair from December 11, 1959 to February 14, 1960.

The Fair will essentially be an exhibition of food and agriculture and will bring home to Indian farmers through educative demonstrations how the battle on the food front is being waged and gradually won by farmers the world over. The Fair will also make a comparative assessment of the progress made in the field of agricultural and allied sciences, village industries and rural and community development activities in India.

The Fair, being organized by the Bharat Krishak Samaj, will synchronize with the Eleventh Annual Conference of the International Federation of Agricultural Producers proposed to be held in New Delhi during that period.

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Research Note

Finding Out Optimum Yields of Jute and Paddy

INTERESTING results have been achieved by the survey work conducted under the scheme for manurial, varietal and agronomic trials to determine the optimum yields of crops in West Bengal. The work was conducted in the districts of Hooghly and Burdwan in respect of two important crops—paddy and jute.

The work done was under two broad heads: (i) crop response to fertilizers and (ii) reconnaissance soil survey of the area under experiment.

Under the first head, simple experiments on farmers' plots were conducted to find out the effect of ammonium sulphate alone and ammonium sulphate plus superphosphate on paddy, and of ammonium sulphate alone and ammonium sulphate together with muriate of potash on the yield of jute.

Jute received three manurial doses comprising (i) control (the farmer's practice), (ii) 30 pounds of nitrogen per acre as ammonium sulphate superimposed on the farmer's practice and (iii) 30 pounds of nitrogen as ammonium sulphate plus 25 pounds of potash as muriate of potash superimposed on the farmer's practice.

THREE DOSES

Paddy also received three manurial doses comprising (i) control (the farmer's practice), (ii) 25 pounds of nitrogen per acre as ammonium sulphate superimposed on the farmer's practice and (iii) 25 pounds of nitrogen as ammonium sulphate together with 25 pounds of P_2O_5 as superphosphate superimposed on the farmer's practice.

Fifty experiments each with paddy and jute were conducted in 50 villages every year over a period of three years. The sites were selected at random. The plots, from 1/3 to 2/3 acre in size were divided into three equal parts each receiving one of the three manurial treatments mentioned above. Soil samples from each of the experimental sites were collected before the experiment and analyzed to determine the nutrient status of the soil.

SOIL SURVEY

Work under the second head consisted of a reconnaissance soil survey of the 3,000-square mile area under experiment. Soil surveying consisted of the examination, classification and mapping of soils in the fields and the recording of their characteristics. The classificational units were grouped into soil associations and the soil associations were identified mainly through original field research. The boundaries among such associations were drawn on the basis of differences in land forms and plant material. The classification did not hold strictly to catenary associations. One-inch-mile Survey of India topographical maps were used. Grids were drawn and the combined grid-road topographical maps were used.

It can now be concluded that for an optimum yield of paddy a mixture of nitrogen and phosphorus is essential in the district of Burdwan, while nitrogen alone gives the highest yield of paddy in the district of Hooghly. For jute, a mixture of nitrogen and potash should be used for optimum production both at Burdwan and Hooghly.

From the point of view of economy, however, nitrogen alone can be recommended for increasing the paddy yield in both the areas. In the case of jute, the picture is somewhat different. The price of jute is high enough to permit the use of both the fertilizers—potash and nitrogen, at least in the district of Hooghly if not in the district of Burdwan.

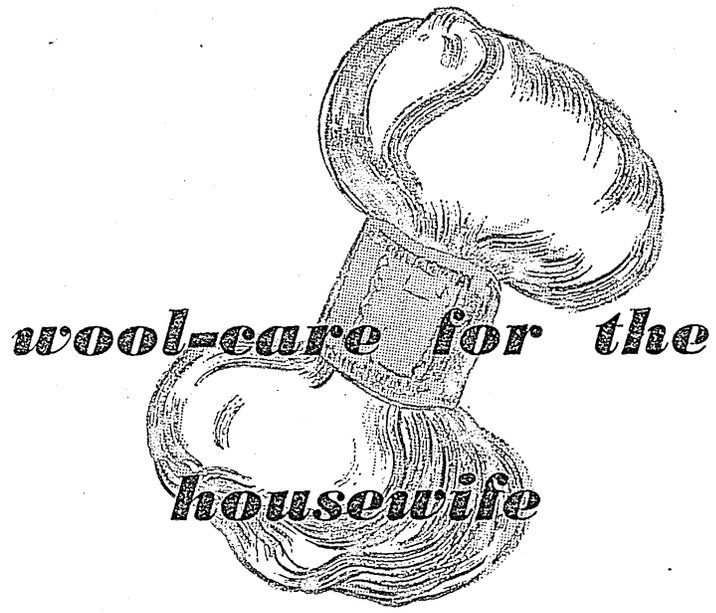
These recommendations, however, do not represent the actual state of affairs if we take into account the nature of the soils we come across. Some areas of red soils and Damodar Flatland soils occurring over buried laterites stand out prominently in this respect. In these areas, nitrogen will get little response from paddy without the addition of phosphate.

These researches further indicate that although on the whole in the Damodar alluvial area application of phosphate over nitrogen is not economical nevertheless there exist some soil types in this big area where the application of phosphate over nitrogen is always essential for increasing the yield of paddy. Similarly, in the case of jute, an economical use of potash has also been found to depend upon the nature of the soil types in the different soil associations.

The results of soil survey have been manifold. First and foremost, from the pedological point of view, the soils have been grouped into classes, families and associations. Thus in Burdwan district (minus the Asansol Subdivision), the morphological studies of the soils have been made, their classification finalized and their approximate boundaries delineated on the soil maps. The soils were: laterites, red, Damodar uplands, Damodar flatlands, Damodar flatlands over laterites, Damodar riverine lands, Ganga flatlands and Ganga riverine lands.

Similarly, in Hooghly district, we came across the following soils: red, Damodar uplands, Damodar flatlands, Damodar riverine lands,

Contd. on page 37



wool-care for the housewife

WINTER is here and it is time you got into your wool garments. Estimate your requirements for the season carefully and try to buy the correct amount of wool at one time. Sometimes, colours vary very slightly between one dyeing and the next, so an odd ounce bought later on may be slightly different in shade from the first purchase.

The baby is prone to soil his clothes quickly. So, when buying wool for the baby, look for the "shrink-resistant" label. Of course, the "all wool label" is the first thing to see.

To keep your wool garments in good shape, you have to pay attention to a few things. A sensible washing routine is all that is required. Do not let them become too dirty before you wash them yourself or send them on to the dry cleaner.

If washing them yourself, make a good lather of warm water and soap or a detergent, immerse the garment and squeeze the water through it without twisting or rubbing. Remember not to put raw soap or detergent on the garment itself.

Too much agitation to remove heavy dirt will make the garment shrink; so instead let it stand in the solution for about half an hour. Rinse in plenty of clean warm water and remove the excess water by rolling in a towel. Finally, pull the garment gently back into correct shape and dry flat on the ground. A pullover hung from a line while wet will be pulled out of shape. Do not dry white or pastel shade garments in direct sunlight, or they will become yellowed or discoloured.

When taking off wool clothes after wear, empty the pockets, brush well and hang on a good clothes-hanger, taking care that the shoulders sit properly.

REMOVING STAINS

A cleaning solvent will remove oily, fatty, waxy or greasy stains from your woollen clothes. If the stain is heavy, place a pad of a clean cloth or blotting paper under the stained area and apply the solvent generously from a clean cotton rag, using a vertical dabbing motion. The stain having gone, brush with light strokes from the centre of the treated area to a distance of about six inches to "shade it off" into the untreated fabrics. For food and drink stains, use cold or warm water. For an unknown stain, try any solvent first and then cold water.

If you have carpets in the house, save them from their worst enemies—shoes, furniture, dust and stains. Whenever possible, change the position of the carpet regularly. Don't stand heavy furniture in the same place on the carpet for an indefinite period.

CARPET-CARE

Carpets should be brushed in the direction of the *lay* of the pile. Take them out often and beat to remove collected dirt. If there is a stain, try to remove it fresh.

If you have spilled a liquid on the carpet, first try to mop as much of it up as possible. Scrape off oil, grease and shoe polish with a blunt knife. If the carpet is of a fast colour, use a brush with a lukewarm solution of a detergent and water or even ordinary soap and water. If the stain is hard to remove, try a dry cleaning fluid. Red ink and copy ink is best removed with methylated spirit.

Any wet part of the carpet should be dried quickly out in the sun. An occasional spraying with an insecticide like DDT or dieldrin, specially under the edges of the carpet, will protect it from wool-eating insects.

BERSEEM GOES HILL-HIKING

by

H. C. Malik

Assistant Economic Botanist, Punjab

Sirsa

BERSEEM grows well in the hills during the winter months: this is what experiments at the Hill Grasses Research Station at Palampur in the Kangra district of the Punjab have shown.

And this is a big step towards solving a major problem facing the States hill farmers—that of providing enough and nutritious green fodder to their cattle at a time when practically no green grass is available. What's more, berseem being a legume also improves the condition of the soil to a great extent.

Green forage is the natural feed of cattle, and its adequate and continuous supply is essential to keep them in good health. While a steady supply of green fodder can be maintained in the plains with the help of irrigation and by growing a number of crops in different seasons, conditions in the hills do not allow this. The limited land at the disposal of the hill farmer is needed for raising grain crops to meet his household needs, and he doesn't have enough money to purchase green forage or concentrates for his cattle.

NO ALTERNATIVE

He, therefore, has no other alternative than to graze his cattle on the grass that comes up on the steep and slopy hillside or his field-bunds. Unfortunately, this facility does not last beyond the summer monsoon months, and as soon as rains cease and the winter takes a severe turn, grasses on the hillsides dry up and fail to sprout. Therefore, all that the farmer can give his cattle is small quantities of dry maize and rice stalks with some hay that he might have conserved. This is neither enough nor nutritious, so his animals live on starvation level and lose in efficiency and milk production.

SUITABLE VARIETY

With the setting up of the Palampur Research Station for improvement of hill grasses and grasslands, a number of improved strains of different grasses and legumes obtained from abroad and the existing crops like berseem and oats were tried to find out a suitable variety that would grow in the hills during winter.

The work has been under way for five years now, and only oats and berseem have given encouraging results, berseem being the better of the two. This is because while oats could be included in the farm economy of the hill farmer only at the cost of the grain crops like wheat, berseem has proved very useful in rotation with maize or rice.

Experiments with berseem were, therefore, carried out at the Palampur Station for three years, 1953-55, with a view to finding out its best sowing time in the hills, interval to be given between two successive cuttings and the forage yield expected.

The crop was sown at varying intervals, starting from the end of August, when the season becomes favourable, to the middle of October. The sowings were carried out at fortnightly intervals in the first year and at weekly intervals in the years 1954 and 1955.

GOOD GROWTH

The seed was duly inoculated with berseem culture and sown in standing water at 12 seers to the acre. The crop on the whole made a satisfactory growth except in 1954 when it was adversely affected by a high rainfall. The harvesting was done as soon as the crop had made normal growth.

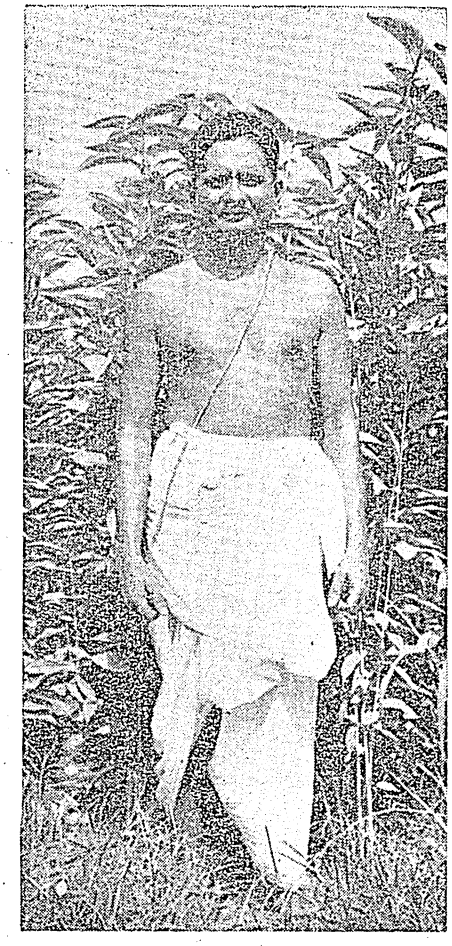
It was seen that the interval between two successive cuttings varied greatly with the sowing time and the seasonal conditions during the growing period. The early-sown crop was ready for the first cutting in 56 to 64 days, but required 143 days when sown in October in 1953, obviously because of the onset of winter. During the severe winter season, the interval between two cuttings was 82 to 110 days, but with the change of season to spring, the crop made luxuriant growth and the interval was considerably reduced.

The behaviour of berseem in the hills in respect of yield was almost like that in the plains, except that the total yields were about half or less according to the soil and other conditions. Four to five cuttings of green forage are possible during the winter season when green grass is almost extinct. Yields can be increased considerably by applying fertilizers. The best time of sowing varies from the end of August to the end of September.

Berseem is already getting popular with hill farmers in the Punjab. Where only a couple of maunds of berseem seed used to be sold to the farmers by the Department in 1951, the sale has increased to more than 60 maunds in addition to the seed arranged by the farmers themselves.

Farmers I Have Met

One Pioneer, The Village Progresses



Shri Chiranjib Roy

THAT the pioneering effort of a single farmer can lead his village to prosperity, has been shown by Chiranjib Roy of Kholta village in Cooch Bihar district, whom I met recently. And Chiranjib has not one but three such successful efforts to his credit.

Chiranjib, who migrated to his present village about 14 years back from Farid Pur, now in East Pakistan, found that only one crop of paddy was raised here. "It greatly surprised me, for I came from an area where three crops were the rule. Of course, there they have the advantage of a land inundated and made fertile by rivers by depositing silt on it. Whereas here, inundation means sheer sand and boulders," he admitted.

But, Chiranjib found out a way of tackling this problem with advice from the local agricultural officers. In addition to manure prepared on the farm, he applied 30 seers per *bigha* of phosphoric acid in the form of superphosphate, and succeeded in raising an *aus* paddy crop. Other farmers, of course, followed suit. Of his 55 acres, he generally puts 30 *bighas* under *aus* paddy.

Another thing that was scarce in the cropping pattern of the village was jute. Soon he found his way to Government Farms for obtaining improved seed, and reserved 25 *bighas* for the crop.

Using ten to twelve *chhataks* of seed per *bigha*, he line-sows his jute crop in mid-March, applies 30 maunds of cow-dung, six to eight maunds of wood ash and 30 acres of phosphoric acid as superphosphate per *bigha*, for preparation of land. Harvesting, steeping and retting of jute starts by the middle of July and the land vacated by jute is put under *aman* paddy. This crop gets the benefit of the residual effect of manures applied to the previous crop and some silting due to inundation of fields during the rains.

Again, it is he who has introduced winter vegetables in the area. Plots growing cauliflower, cabbage, chillies, brinjals and radish are now a familiar sight in the village. He has not forgotten fruits either. About two *bighas* on a plot near the *bundh* of his tank grow bananas interspersed with pineapples. "They not only yield valuable fruit crops, especially the bananas which bring in a yearly profit of Rs. 200 per *bigha*, but also lend beauty to my farm," he says.

—M.P.G.

PLEASE CORRECT

In the article "Man of the Month" by M. G. Kamath published in the September, 1958 issue of *Indian Farming*, on page 5 col. 1, para 2 from below, the names of sugarcane varieties are wrongly given as *112* and *113*; these should be *312* and *313*. In the "Man of the Month" published in the October, 1958 issue of the Magazine, on page 8, col. 3, line 3 from below, the yield of potatoes is given as 32 maunds; it should be 32,000 pounds.

Rice Facts

The total production of rice the world over (excluding the U.S.S.R.) was about 215 million tons (metric) in 1956. Of this, Asia accounted for over 20 million tons.

* * *

India is the second largest producer of rice (the first being China—82 million tons) with an aggregate yield of about 43 million tons.

* * *

Though India and China have the largest area under rice cultivation, the highest per hectare (2½ acres approx.) yield (1956) was accounted for by Spain (5,810 kgs; a kilogram=one seer and 1·2 *chhatak*) followed by Egypt (5,430 kgs.), Australia (5,290 kgs.), Italy (4,690 kgs.), Portugal (4,230 kgs.) and Japan (4,220 kgs.).

* * *

In India, the area under rice cultivation extends over 78 million acres. The yield per acre is only about 544 kilograms.

In 1957-58, the top five producers of rice among the states were West Bengal (41,85,000 tons), Andhra Pradesh (34,68,000 tons), Madras (31,34,000 tons), Uttar Pradesh (22,84,000 tons) and Bihar (21,98,000 tons).

Contd. from page 33

RESEARCH NOTE

Ganga flatlands, Ganga lowlands and Ganga riverine lands.

CROP AND SOIL

The reconnaissance soil maps provide a systematic basis for the study of crop and soil relationship with a view to increasing soil productivity and helping the conservation of soil fertility. Thus appropriate crops and fertilizers can be selected from the point of view of soil development and irrigation. The results of field experiments, whether varietal or manurial, rotational or involving soil management, can now be used with advantage with the help of the soil map of the area. Crop rotation and fertilizer applications can best be planned with the help of the knowledge provided by these maps. Some progress has also been made in respect of soil conservation. Where a probability of soil deterioration has been indicated either as loss of the topsoil or actual loss of the soil, the erosion characteristics and the nature of the soil brought out by this research provide data in planning and execution of a programme of soil conservation or reclamation of flood-damaged areas.

Although sound irrigation rating of soils depends upon the identification and appreciation of the individual soil types, some headway has been made in grouping land units and their capabilities under irrigation. Highly susceptible and less susceptible soils and areas likely to affect the water-table both of the irrigated and of the adjacent unirrigated lands, have been revealed by this soil survey. Provision for adequate drainage has also been stressed for some soil tracts. All in all, the important problems confronting agriculture in the survey areas have been touched upon, though still much remains to be done.

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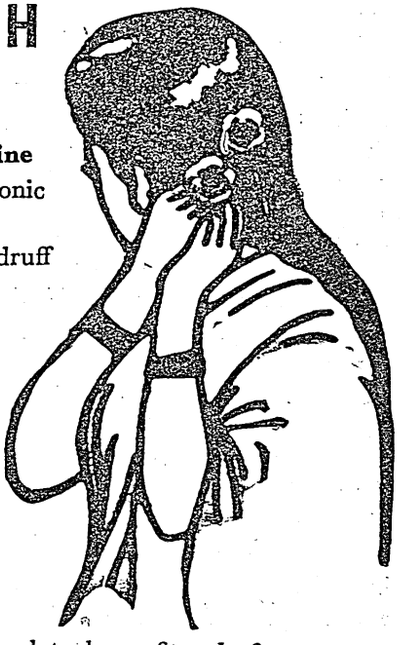
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No More Trouble From the Cotton Bollworm

by

E. V. Abraham
Assistant Entomologist

and

M. Basheer
Government Entomologist

Coimbatore

THE spotted bollworms of cotton should not be a problem with the Madras farmer if he knows endrin and parathion.

When cotton cultivation was introduced in the rice fields of the Tanjore delta recently and the area under the crop increased, the damage by the pest reached an unprecedented magnitude. Their control has been a difficult problem due to the concealed existence of the larvae inside the plant tissues.

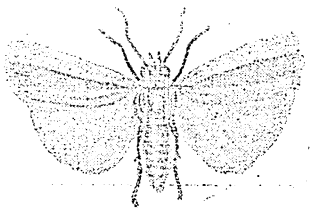
The utilization of rice fields during the fallow season was ventured upon as a novel enterprise in 1950 with a view to increasing the output of cotton in the State. The variety *Punjab 216 F* was ideally suited for cultivation in the rice fallows. The crop is sown by February-March immediately after the harvest of paddy, and by the time the paddy crop is to be raised in June-July the cotton plants are pulled out. This attempt at cotton cultivation in the rice fallows has proved to be a signal success, but the spotted bollworms have become the worst enemies of the cultivator.

The pest makes its appearance on the crop about six weeks after sowing. The initial damage is caused to the tender shoot tip of the young plant. The caterpillar bores into the shoot from the growing tip downward. As a result, the shoot tips fade and droop down.

Normally, fresh shoots are put forth and the plants come up. Instances of young crops having been completely destroyed, necessitating a resowing, have been



The caterpillar



An adult moth

noted in parts of Tanjore district in certain years. As the plants grow and put forth buds and flowers, caterpillars infest these plant parts too and cause their shedding in large numbers. When bolls are formed, they too are bored into. The damage to the bolls leads to fungal invasion and the consequent decay of the bolls. Investigations have shown that 28 per cent of the buds and bolls are damaged by the pest in certain years, the average extent of damage being about 15 per cent.

Mechanical removal of the attacked plant parts, light trapping of the moths, biological control by the liberation of parasites in the field and enforcement of the Pest Act to provide a sufficient gap between two

seasons were the old methods adopted for keeping the pest under check. These methods had their own limitations and the pest could not be eliminated to the desired degree.



A caterpillar has already bored into this cotton boll



A young shoot dies as a result of caterpillar attack

With the advent of the modern insecticides, the scope for a better control was in sight and experiments were conducted with a number of insecticides at the Agricultural Research Centres at Aduthurai and Coimbatore from 1952 to 1957. The insecticides, viz., Agrocide cotton dust, and sprays and dusts of DDT, BHC, aldrin, dieldrin, endrin, chlordane, toxaphene and parathion ("Folidol") were tried at normal dosages. Repeated experimentations have shown that the two insecticides endrin and parathion are outstandingly effective in controlling the pest and securing significantly higher yields for the cultivator, leading to substantial profit for him.

For controlling the pest, three rounds of spraying at tri-weekly intervals, commencing from the ninth week stage of the crop, after sowing, are sufficient. It has been found that commencing the treatments earlier, say at the sixth week stage when the pest makes its initial appearance, does not serve much useful purpose as the pest population then is too negligible. Further, efforts to wipe out the pest in the very early stage proved

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futile and resulted in increased cost of pest control operations.

Both endrin and parathion are almost equally effective in controlling the bollworms as also the cotton aphid *Aphis gossypii* G. and the leaf roller *Sylepta derogata* F. The latter insecticide brings about a spectacular control of the cotton jassid *Empoaxa devastens* D too. In the case of endrin-treated plots, a build up of mites has, however, been noticed towards the late stage of the crop, but generally this is not a problem on the short-duration rice fallow crop which is retained in the field for about five months only. As regards parathion, the chemical is also highly efficacious against mites, mealy bugs and scales against which endrin is ineffective. A combined infestation of these pests is sometimes experienced in the late stage of the main season long-duration varieties, and in such cases the use of parathion is advantageous.

ECONOMICS OF SPRAYING

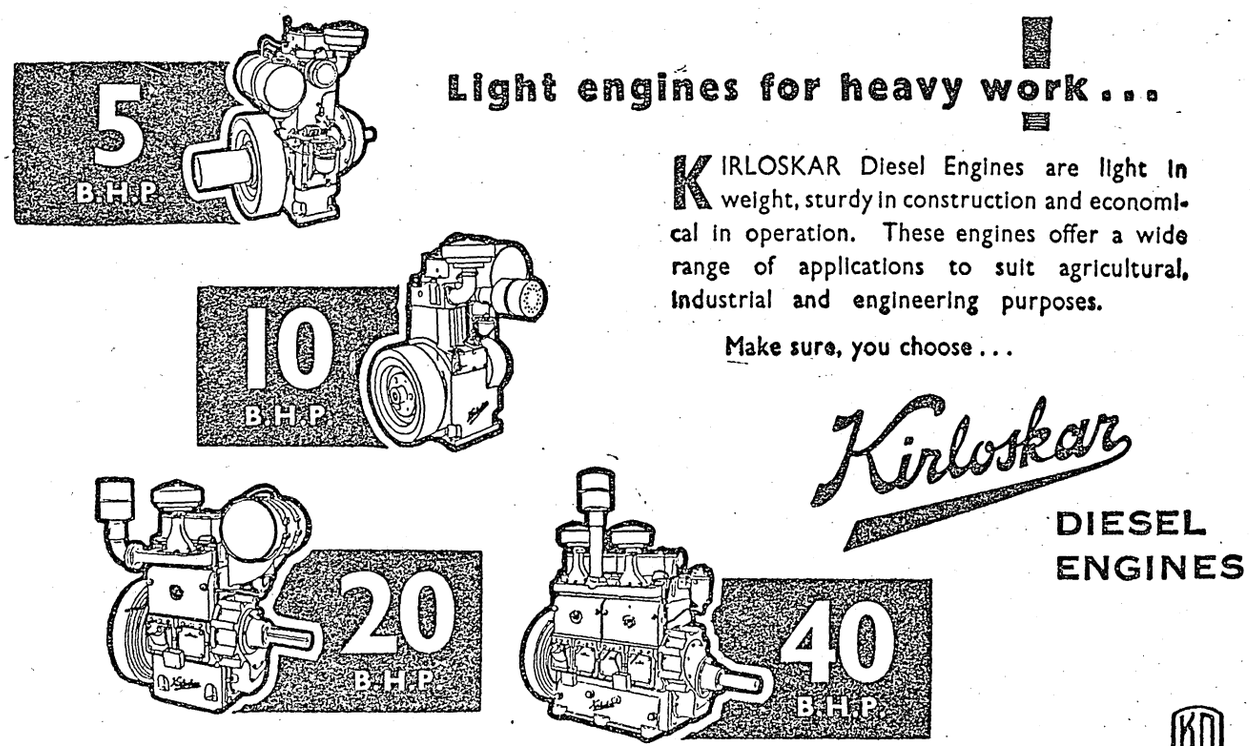
The economics of the spraying, furnished in the table in the next column, speaks very encouragingly of the two chemicals.

Both the insecticides have secured good results. About a 100 gallons of the spray fluid are required for covering an acre with the use of high-volume spraying equipments. The insecticides are to be used at the dilutions recommended. The total quantity of the active ingredient applied during the cotton season in one acre works out to 0.6 pound of endrin and 0.7 pound of parathion.

Both endrin and parathion are highly poisonous, so due precautions should be taken while handling them. Any accidental contact with the skin should immediately be followed by washing with soap. Inhalation of the concentrated solution, smoking, chewing and intake of any liquid or solid substance should be avoided by persons engaged in the spraying operations.

Treatment	*Average reduction percentage in infestation*	*Average increase in acre-yield*	*Value of increased yield* *	*Cost of spraying an acre thrice*	*Net profit*
Endrin 0.02 per cent (an ounce of 19.5 per cent emulsificable concentrate in 6¼ gallons of water)	45.2	432 pounds	190.08 (at Rs. 7.40 as value of the chemical and two rupees as labour charges for one round of spraying)	28.20	161.88
Parathion ("Folidol") 0.025 per cent, i.e., an ounce of "Folidol E 605" in 12½ gallons of water	50.5	483 pounds	212.52 (at Rs. 7.64 as value of the chemical and two rupees as labour charges for one round of spraying)	28.92	183.60

* *At Re. 0.44 per pound of cotton*-kapas



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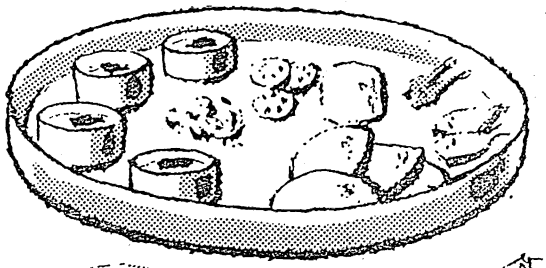
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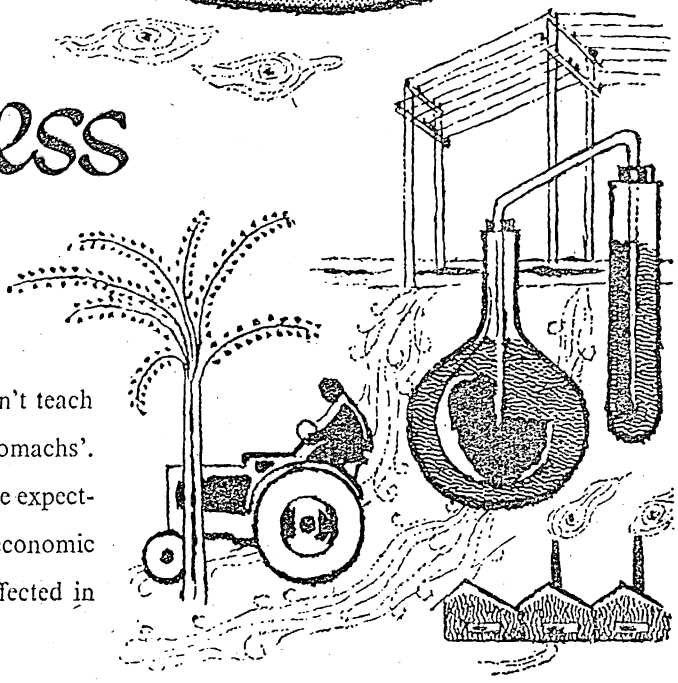
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Food and Progress





An oft-quoted saying goes, 'You can't teach religion to people with empty stomachs'. Similarly, ill-nourished people cannot be expected to shoulder the burden of the economic and social revolution that is being effected in our vast country.

However, the term 'ill-nourished' is not necessarily concerned with quantity. We may indulge in a series of large meals and be ill-nourished; we may enjoy delicacies every day and still remain ill-nourished. A properly nourished person's diet, though simple, will be *balanced.* Every day, it contains the correct amounts of fats and proteins, carbohydrates, minerals, and vitamins. To active adults and growing children, fats are of utmost importance —they provide 2½ times as much energy as wheat or rice, and build up reserves in the body that help to resist disease.

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Who wants more food ?

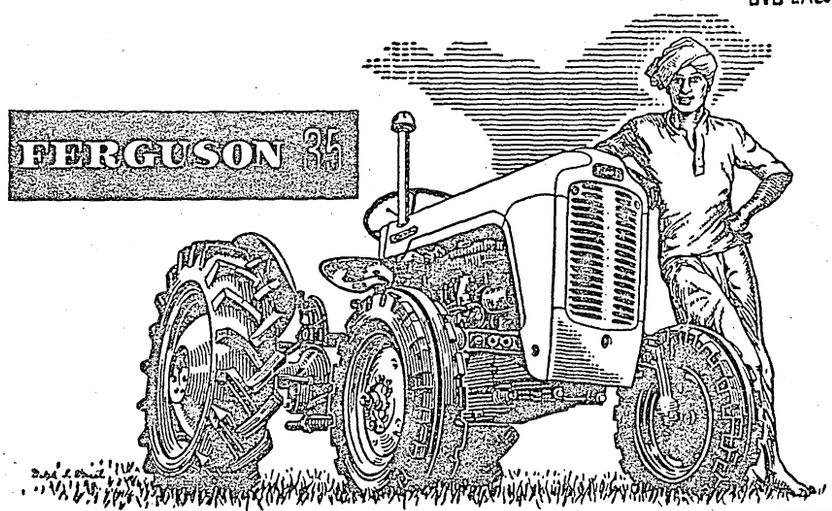
My basic job is to assist in raising this country's food production from its present low level—so low that we have to buy abroad.

The extent to which I can help is very often not realised—it certainly is not realised enough.

Whether it is wheat or rice—gram or grass—sugar or groundnuts—whatever it is, only I can reliably and economically :

- Have the soil ready for the rains or water,
- Prepare the best tilth to suit the crop,
- Sow quickly and well on the right day,
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- Harvest at the right time,
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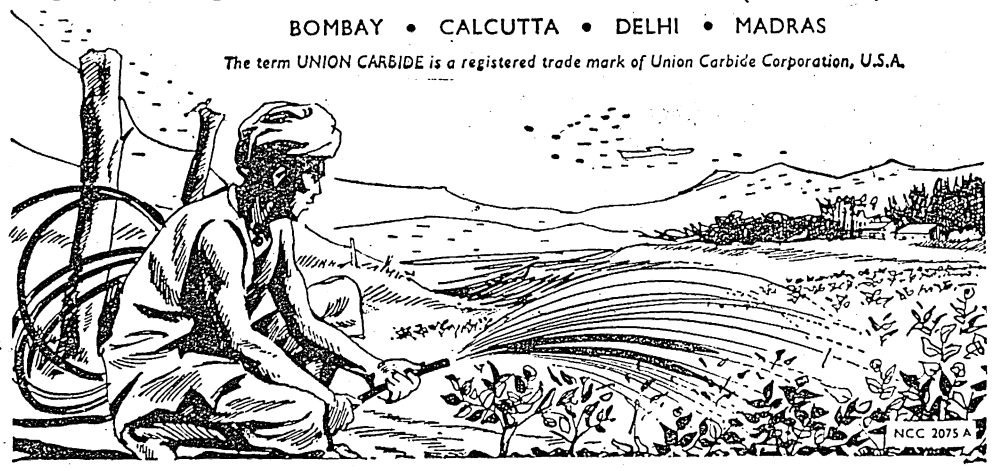
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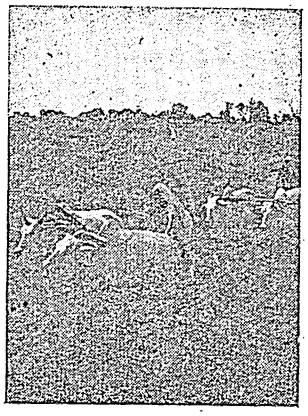
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Photo by H.K. Gorkha

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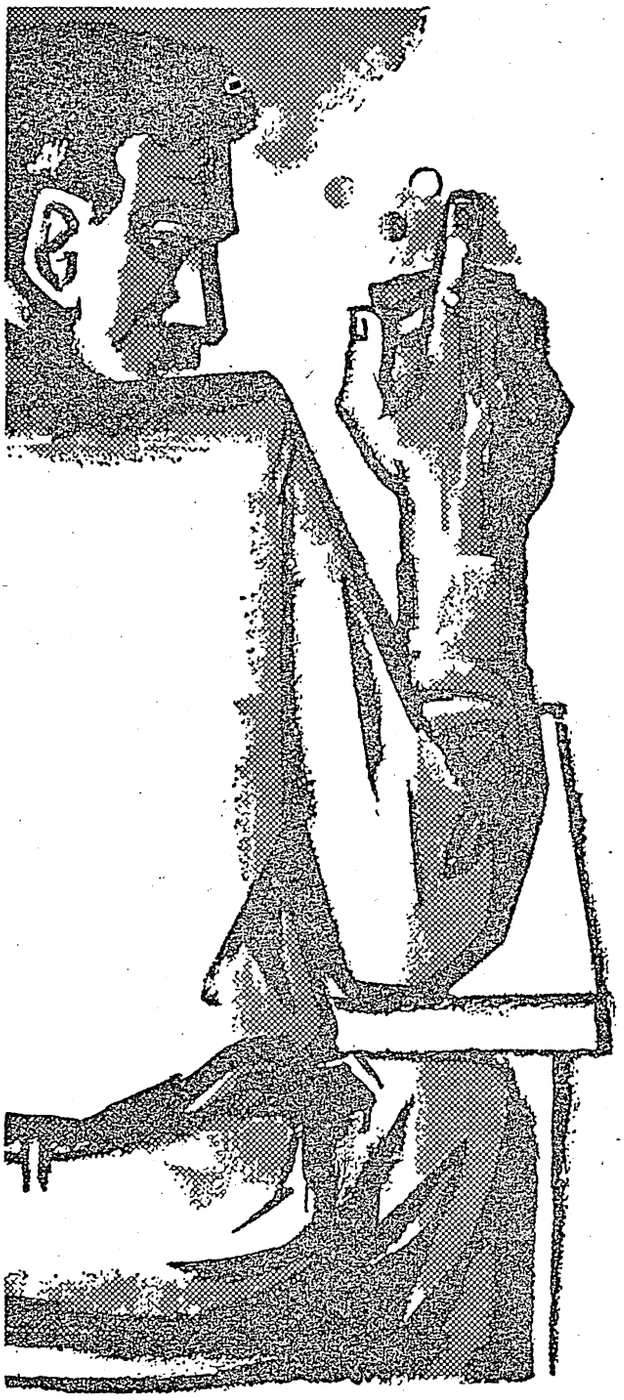
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editor's page

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EFFICIENT AGRICULTURAL ADMINISTRATION

THIRTY years ago, the Royal Commission on Agriculture in India made certain suggestions for a proper development of agriculture in the country. These received but nominal attention. Recently, the Nalagarh Committee went into action and has come out with a strong plea for according agriculture a position of major importance.

While making its recommendations, contained in its report submitted to the Government, what the Committee has been having in view is Agricultural Departments attuned to the needs of the day and the interests of the cultivator, and operating in an " efficient manner." It, therefore, suggests that the agricultural administration must be rid of all complexities, the " low morale " at present prevailing among the agricultural services eliminated and the service conditions in the Agricultural Departments made more attractive for our youngmen. Only in this way, agriculture would be able to command its due share of the nation's intellect which it has hitherto missed. Equally necessary it is to maintain competency at a high level. This should be done by reviving the " fast disappearing " practice of training the subordinates and introducing well-thought out training programmes and refresher courses for officers of all grades.

Dealing with programme planning, the Committee recommends that a " technological balance " should be maintained in drawing up programmes for different areas. The progress of works and schemes, both at the Centre as well as in the states, should be properly assessed from time to time by special committees appointed for this purpose. Works and schemes, however, would not proceed smoothly and a maximum utilization of the resources would not be possible if there was no proper co-ordination between the various departments, an example in the case being the Agricultural and Irrigation Departments.

The Committee considers the present system of fixing state-wise targets defective. If agricultural production in the country has to make any real headway, integrated plans for every village should be formulated. The concentration of expenditure during the last quarter of the financial year should be avoided and " there should be the greatest delegation of powers at all levels."

The Committee has laid a great stress on " the principal task of educating the farmers." It is firmly of the opinion that the Agricultural Departments should deal with technical knowledge rather than " trade in supplies." They should provide facilities for educating and training the farmers, demonstrating better methods of cultivation, disseminating knowledge through audio-visual aids and organizing farmers for adopting improved techniques of production.

The Committee recommends that Centrally administered godowns situated conveniently in various parts of the country should be opened to receive and store fertilizers for supply to consuming centres. The quota of iron and steel for agricultural purposes should be increased substantially according to state demands. The entire organization for the supply of fertilizers, improved seeds, insecticides, agricultural implements, etc., should be separated from the Extension and technical functions of the Agricultural Departments and transferred to co-operative organizations.

Not feeling satisfied with the research programmes at present under way, the Committee states that there is a clear necessity for establishing major research stations to serve the needs of every agro-climatic region. At least one of the regional stations should be developed into a first-rate, post-graduate training institution for research, education and Extension. A closer co-ordination should be maintained among the research, education and Extension branches.

The Report, in conclusion, emphasizes that with the expanded scope and nature of their responsibilities, Agricultural Departments in the states need " a clear sense of purpose, an adequate set-up competently manned, well-defined duties for each rank, adequate inspection and supervision at all levels and a sense of urgency." The Committee feels confident that " the food situation of the country can be appreciably eased if positive steps are taken to achieve this objective." It is hoped that the recommendations made by the Committee will receive from the states the attention that they deserve.

BAD AGRICULTUR
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Making Profits Jump Up With a Few Acres

by
M.G. Kamath

SHRI Bibhuti Bhushan Samanta of Badrait near Barashat in the 24 Paraganas in West Bengal is a farmer who is making a good living.

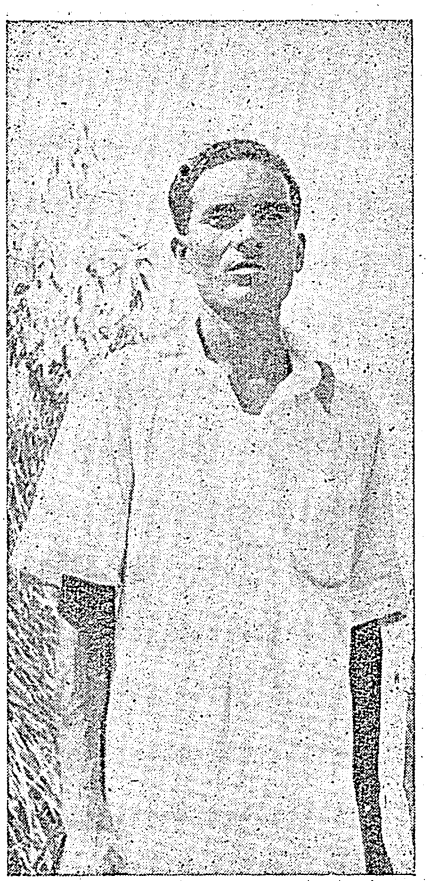
The tiled farm cottage, the neat little flower garden, the well-stocked implement and farm equipment store, the new grain store and well-dressed and healthy children reflect the good living standards that Bibhuti has been having.

"All by God's good grace," said Bibhuti when we met him at his Badrait farm.

"Plus good farming," was the comment of Extension Officer Dutt who had accompanied me to the farm.

"Mother Earth can be kind, I have learnt these three or four years, if you know the tricks of pleasing her," said Bibhuti, pointing to the newly-harrowed soil which he was planning to plant with potatoes.

The Mother Earth in Bibhuti's case extended only to 2.3 acres.



Bibhuti Bhushan
Mother Earth is kind

Making a good living from 2.3 acres! I wondered.

But the 12-foot tall jute and the *aus* paddy with heavy swinging ears in another field soon put me at ease.

Half the farm area was lowland where *aman* paddy was grown, and the other half upland where jute, highland *aus* paddy, vegetables such as cauliflower, tomatoes and radish were grown.

RISE IN YIELDS

And why Mother Earth was kind to Bibhuti was seen in the yields of the two important crops—rice and jute, on the farm:

Rice —18 maunds an acre; three years ago, it was ten maunds.

Jute —18 maunds an acre as against 12 maunds of three years ago.

The rise in the yields of both the crops was due to the improved methods Bibhuti adopted, and which were, in his words:



A shoulder-high paddy crop is now usual on the Bibhuti farm

"For both jute and rice, I sow improved varieties. I grow the *Chinsura Green* and *J.R. 632* varieties of jute and the *Surajmukhi*, and *Kataktara* varieties of rice. I was told these would give higher yields than the local seeds. They did.

BOTH IN LINES

"Next, I sow both the crops in lines. I have bought a seed-drill for jute. I plant my paddy in lines.

"Why? Because it saves seed; interculture is easy with hoes; I save on labour too. This means less of expenditure, and the lesser the expenditure the more the profit.

"Thirdly, I use fertilizers. For jute, I give a dose of 1½ maunds of ammonium sulphate per acre and, for paddy, two maunds of the fertilizer mixture I get from the Agricultural Department.

NO PESTS

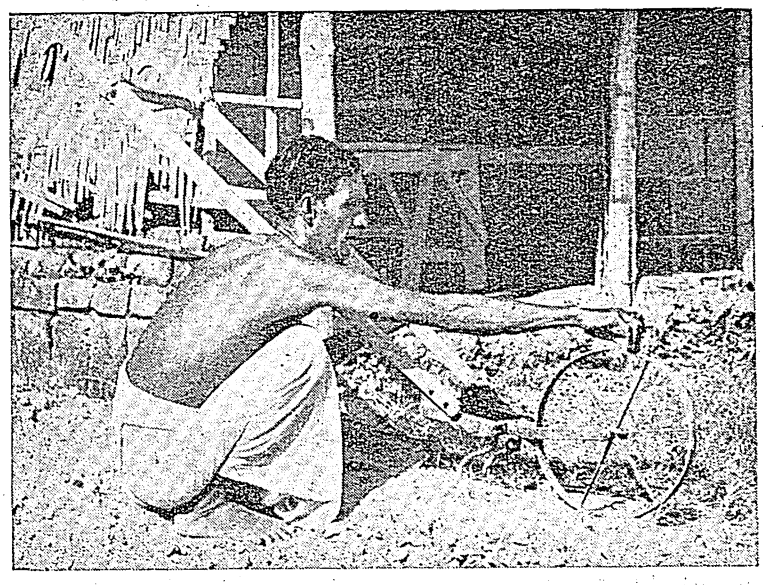
"Fourthly, I see to it that no pests bother my jute or rice crop. Last year, I had the semilooper and hairy caterpillar trouble on my jute crop. I sought advice and dusted ten per cent BHC on the crop.

"I always keep a duster handy. It is cheap enough. I also lend it to my neighbours for similar use."

So it was that Bibhuti had learnt the tricks of good farming. The farm being close to the highroad, it was an ideal spot for the Extension people to bring farmers around and see the improvements Bibhuti had made. A couple of signboards in Bengali planted on the bunds tell a tale of how Bibhuti uses improved seed and sows in lines.

When we started to move out, Bibhuti also was dressed up for going to the town.

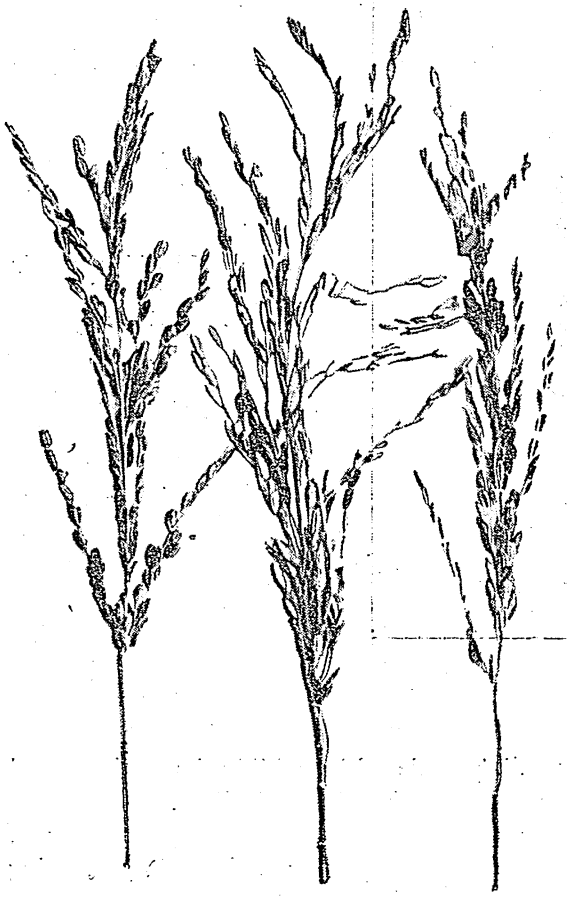
"For getting vegetable seeds. I am particular that I get good, certified seeds," was his explanation.



One of the implements Bibhuti is proud of is the hoe for working in jute lines

Better Keep Brown Leaf-spot at Bay

by
Kishan Singh Bedi
Plant Pathologist, Punjab, Ludhiana
and
Harmohindar Singh Gill



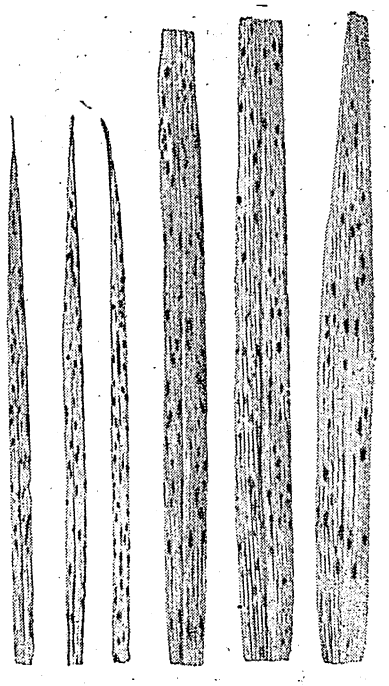
Severely infected panicles

HOW often the happy prospect of a bumper rice harvest has been ruined by the sudden outbreak of the brown leaf-spot disease. In the Punjab, the disease is quite serious in the Kangra and Kulu Valleys, Gurdaspur, Hoshiarpur, Amritsar, Jullundur and Karnal and causes heavy losses. The historic Bengal Famine of 1942-43 is also attributed to this disease.

The disease is caused by the fungus *Helminthosporium oryzae* Breda de Haan (=*Cochliobolus miyabeanus* (Ito and Kuribayashi) Drechsler ex Dastur), which produces conidia in abundance under the influence of high humidity. They are mainly disseminated during rains accompanied by wind.

The causal fungus of the disease overwinters in the diseased plant debris left behind in the fields after harvest. Subsequently, it remains on the surface of the soil as also in the infected straw stacked or stored for future use as litter or bedding for cattle, or for any other purpose. It also survives in the infected grains which are the produce of a diseased crop. These two sources result in the primary infection of the disease which later multiplies through the secondary infection.

The symptoms of the disease have been recorded on the coleoptile, the primary shoot, leaves, leaf-sheaths nodes, glumes and the seeds.



The leaf-blades develop distinct spots

The first symptoms of the disease may be observed immediately after the germination of the seed in the nursery which is transplanted in the Punjab State during June-July. Brown discolourations appear on the coleoptile, from which the infection spreads to the hypocotyl of the seedling. Generally, the seedlings with lesions on the coleoptile and the hypocotyl eventually die. This is the seedling-blight phase of the disease, which causes heavy damage in nurseries raised from severely infected seed.

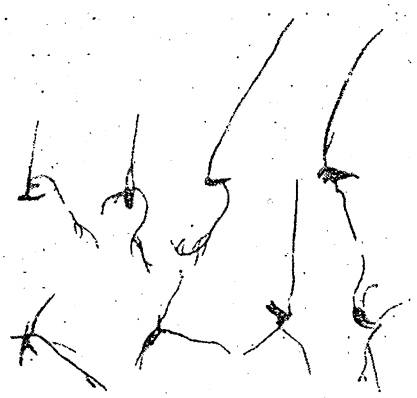
Spots on the leaves are very common and are the first conspicuous symptoms on the aerial parts. They are noticed particularly during the months of July and August. At first, they are small, pinhead-like brown areas on both the surfaces of the leaf. They vary in size and shape from small brown specks to definite eye-shaped lesions, which may measure from one to ten millimetres in length and 0.5 millimetre to three millimetres in width.

DISTINCT LEAF-SPOTS

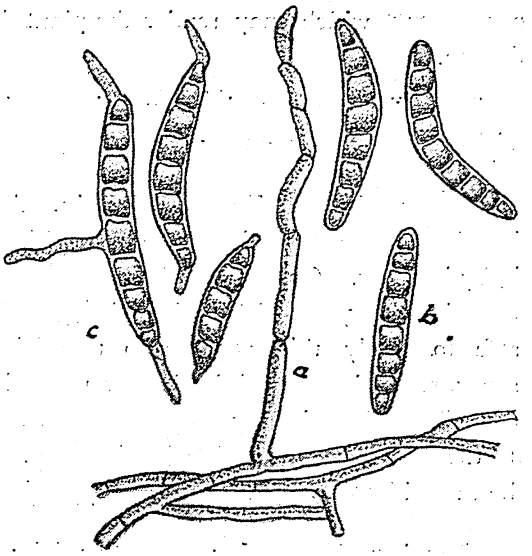
The lesions are distinct, isolated and scattered over the entire surface of the leaf. Whereas the small spots are dark brown or purplish-brown, the larger ones have a similar colour only at the margin, and are pale yellow or dirty white towards the centre. In the case of a severe infection, the affected plants assume a dry and scorched appearance.



The grains get partially or completely discoloured



If infected kernels are sown, the seedlings will have lesions on the primary root and shoot



The causal fungus—*a*. a conidiophore, *b*. a conidium and *c*. a conidium showing three germ tubes—one emerging from the central cell and two from the two ends

The spots on the leaf-sheath are similar to those on the leaf, but they generally appear only under conditions of severe infection when even the nodes become infected and show a purplish-brown colour. The infection of the inflorescence is very common and results in the ear-blight phase of the disease. It is this phase of the disease which may cause the maximum amount of damage to the crop. In severe cases of infection, the sterility of the panicles is complete, all the grains therein being blighted.

Spots on the glumes, while they are still green, look much the same as those on the leaves, except that their size is smaller and the brown edges of the spots continue to be visible even after maturity.

KERNEL INFECTION

Infected kernels, which are not blighted and killed, may become partly discoloured or entirely brown. It is such seeds that, when sown, give rise to heavy seedling blight and the subsequent phases of the disease.

The denser the transplanting of the seedlings the greater is the intensity of the infection. A transplanting distance of nine to 12 inches from seedling to seedling in a foot apart rows reduces the infection appreciably, because the inoculum of the disease does not multiply very rapidly in that case due to lower humidity within the crop.

The presence of potash in a mixed fertilizer tends to reduce infection by counteracting the effect of the other

components which may render the plants liable to the disease.

The following control measures lower the incidence of the disease to a great extent.

Destruction of diseased debris. After harvesting the crop, collect all the debris carefully and destroy it by burning. Or, convert it into compost, in which case also the causal fungus loses its viability and it is safe to apply this manure to the fields. Infected straw, stacked or stored for further use as litter or bedding for cattle or for any other use, must not find its way to the fields to be put under the rice crop. It must also be turned into compost before it is applied to the fields.

Burying diseased remnants with an inverting plough. Since the collection and destruction of the diseased debris cannot ordinarily be carried out perfectly and some of the inoculum of the causal fungus does persist in the remnants, these should be buried underground with an inverting plough, like the "Rajah" or the "Meston."

Rotation. Rotation and, consequently, the avoidance of successive cultivation of the same crop in the same field, is one of the very effective natural means of destroying the infectious inoculum of the disease in the infected debris left behind in the fields after harvest. As far as possible, do not grow rice in the same field year after year ; instead, rotate it with some other crop, like maize, which is not susceptible to this disease.

Balanced fertilization. The use of a fertilizer mixture containing the three major elements—nitrogen, phosphorus and potash, in a balanced proportion invigorates the plants. They can then stand the attack of the disease much better than those receiving high doses of only one element, especially nitrogen. A fertilizer mixture of three parts of sulphate of ammonia, three parts of superphosphate and one part of sulphate of potash is recommended.

Density of transplanting. A transplanting distance of nine to 12 inches from seedling to seedling in a foot apart rows restricts the infection appreciably.

Seed-treatment. Infected grains constitute a very important source of primary infection. The seed should, therefore, be treated before sowing with a good fungicide or with hot water.

Treat the seed with an organo-mercurial fungicide like "Ceresan" or "Agrosan G.N." at one part of the fungicide for 400 parts of the seed. The treatment can best be done in a seed-mixer. Sow the treated seed immediately ; if it is necessary to store it for some time, store it in a dry place where moisture cannot reach it.

Though the organic-mercury fungicides reduce the primary infection from the infected grains to negligible proportions, yet to destroy even the very deep-seated kernel infection which escapes destruction in the case of a treatment with surface seed-disinfectants, the hot water treatment has to be resorted to. Soak the seed to be treated in ordinary cold water at room temperature for 12 to 24 hours. Then, subject it to a uniform temperature of 52° to 53°C for about 15 minutes. Sow the seed immediately; if it is to be stored for some time, first dry it thoroughly under shade.

Remember, the use of a fungicide or hot water to treat the seed will give good results only if the seed is treated to cover large areas in a locality. If one farmer treats his seed but his neighbour does not, his efforts are nullified due to the secondary infection emanating from the crop grown from untreated seed.

Resistant varieties. The best method of control is to use resistant varieties when available and which may be suited to a particular locality. Sufficient resistance to the disease has not been observed in any of the commercial approved and improved types of rice being grown in the Punjab. Two varieties, namely, *China 972* and *China 996*, though resistant, are not agro-commercially suitable and, therefore, cannot be recommended as such. They can, however, be used as a source of resistance for breeding new varieties for the State.

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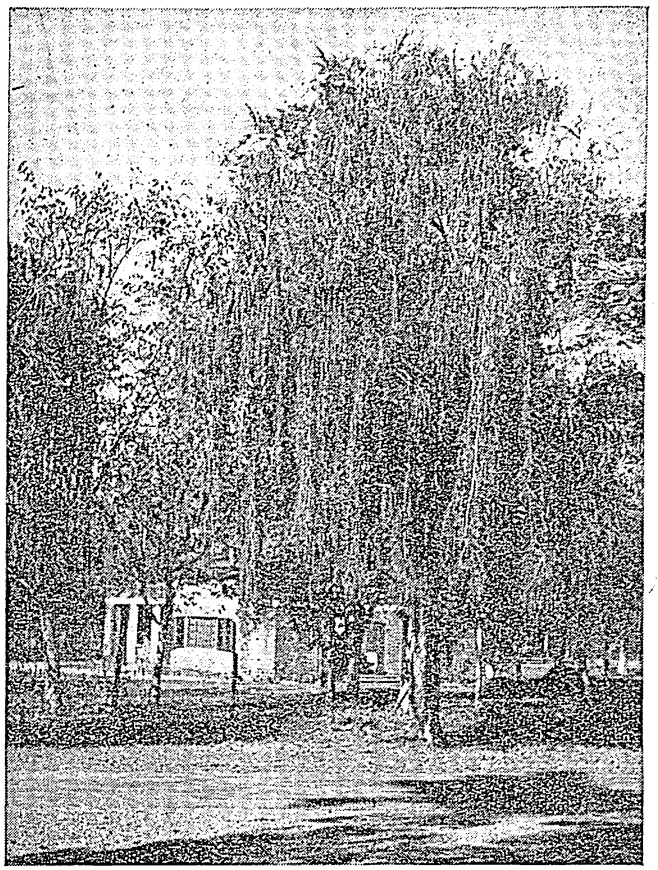
FOREST RESEARCH INSTITUTE

The Bottle-brush

a welcome guest to our gardens

by

M. D. Chaturvedi



The bottle-brush growing in the campus of the Forest Research Institute, Dehra Dun

HAILING from Queensland and the New South Wales in the continent of Australia, the bottle-brush tree has found a warm welcome in our parks and gardens. It is an ornamental tree sought for its beautiful flowers, uncommonly pretty foliage and gorgeous shade.

The bottle-brush is an evergreen tree of moderate height and pendulous crown. It is known as *cheel* in the Dun Valley. The botanists call this species *Callistemon viminalis* because of the beautiful (Greek *kallos* beautiful) stamens of its flowers.

The individual leaf is narrow, dark green, leathery and, when crushed, has a characteristic aroma. The branches hang down, giving a pendulous effect.

The flowers appear in June. They are suspended in densely threaded cylinders, suggesting a bottle-brush which they resemble both in shape and size, whence its common name. The stamens are brilliantly coloured and overtop the petals—a characteristic feature of the flower.

The tree is best raised from seed sown in boxes with well-prepared garden soils sprinkled with sand. The seedlings are then put out in nurseries. They stand transplanting well.

The bottle-brush tree thrives best in moist, well-drained loams in localities with an average annual rainfall of about 40 to 60 inches. In the dry hot regions of western India, it is extremely difficult to raise.

In England, by hard annual pruning, dwarf sizes of the bottle-brush tree are produced. It propagates freely by cuttings. A number of varieties have been evolved with colourful flowers and are raised as small shrubs and pot-plants.

AN ORNAMENT

In Indian parks, the bottle-brush is grown as a tree. It loves full overhead light. Young plants require protection both against excessive frosts and droughts.

The tree is cultivated only as an ornament to adorn open spaces in parks and gardens. It serves no other purpose than providing shade and shelter as a welcome relief from the heat and swelter of the plains. It is prized for its colourful flowers.

TWO ARCH ENEMIES THAT BRING JUTE YIELDS DOWN

by
N. Dutt
Jute Agricultural Research Institute
Barrackpore, W. Bengal



Semiloopers (shown by arrow marks) active on a jute plant

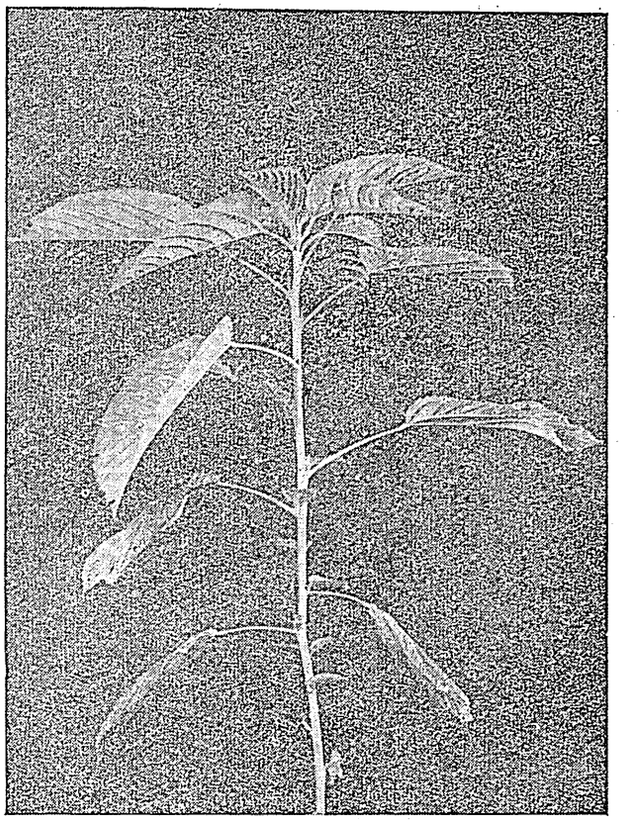
This is what remains of a jute crop after a semilooper attack



TWO arch enemies of the top leaves of both the cultivated species of jute, namely, *C. olitorius* and *C. capsularis*, are the jute semilooper (*Anomis sabulifera* Guen) and the yellow mite of jute (*Hemitarsonemus latus* Banks). Both the pests are widespread all over the jute-growing tracts of the Indian Union including the areas recently brought under jute cultivation in Uttar Pradesh.

The young top leaves of a crop are important in that they keep the plants growing. Damage to these leaves means a check on plant growth and yield, particularly in the case of jute where fibre is obtained from the stem and the crop-duration is hardly four months.

The jute semilooper is the most destructive caterpillar pest and may bring down the fibre yield by 14 per cent. Taking the decrease in fibre yield at five per cent in 1951, the total fibre loss was estimated to be 11,69,500 maunds of the total outturn of 46.78 lakh bales in the Indian Union.



On the way to recovery from a yellow mite attack—normal apical leaves have started appearing above the curled ones

In the case of a semilooper outbreak, not a single plant escapes its wrath. The folded leaves or the leaf-buds, the growing stem-tip and the top leaves are the worst sufferers, the susceptibility spreading down to the fifteenth leaf. However, the extent and intensity of the attack decreases gradually in the lower leaves. A hundred per cent incidence has been recorded in the first fully opened top leaf, and only 0.03 per cent in the fifteenth leaf. In about 80 and 95 per cent cases, the incidence of the attack has been found to be limited down to the seventh and the ninth leaf, respectively.

The females deposit their eggs singly at random on both the surfaces of the leaves, preferably the lower one, which are usually well-distributed throughout the entire crop. A single female lays several hundred bluish-green eggs which are perfectly camouflaged by the leaf-colour, seldom attracting any notice. The eggs are more or less globular in shape, a little flattened, with dorsal-radiating striae and a smooth ventral surface. Each egg measures about 0.57 to 0.68 millimetre across.

EASILY RECOGNIZED

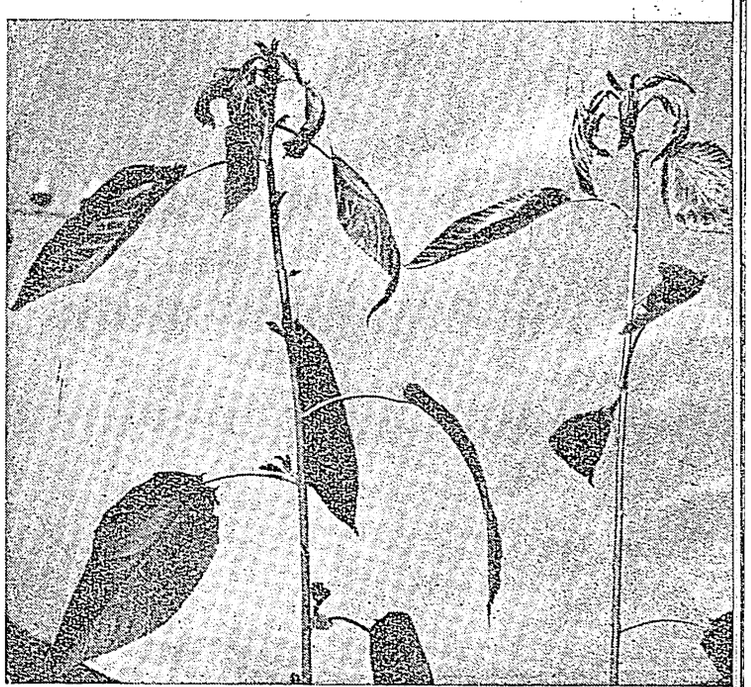
The tiny caterpillars hatch out after about two days. These caterpillars, or jute semiloopers, can be easily recognized by the presence of short, black hair, each on a small black papilla encircled by a white ring. The number of abdominal legs or the pseudopods, however, varies in the early and late instars. Late instars, characterized by four pairs of fully developed pseudopods and an atrophid fifth pair, cause serious damage to the crop and make the grower conscious of their presence. The length of the caterpillar's life is very variable, usually covering about nine to 16 days.

During the pre-pupal stage, the caterpillars develop a reddish tinge on their body. The pupae are often formed during the jute season on the upper surface of the leaves and remain there firmly attached by a strong thread. The pupal period covers about a week, and then adults emerge. Pupa formation also takes place in dried leaves and in the cracks and crevices of the soil, particularly during the last brood when it goes for hibernation. There are usually three, and sometimes four, broods during a season, but it is the second brood which causes serious damage to the crop.

PEAK PERIOD

The period from the early part of July to the middle of August represents the peak period of the incidence of the pest and two to three weeks intervene between two successive waves of the attack. The caterpillars never form any swarm, but the widespread damage is mainly due to the more or less uniform distribution of the eggs over the entire crop.

Jute plants attacked by the yellow mite. Note the attacked curled apical and normal basal leaves



A delayed monsoon favours an outbreak of the pest, sometimes in an epidemic form, as happened in 1950, 1951 and 1955. A delayed monsoon preceded first by some early showers and then by a drought seems to encourage the pest to break out in a severe epidemic form, as in 1952 and 1958.

Insecticides in the form of dust formulations often behave erratically when applied on the tall jute crop against semiloopers, possibly because of the adverse rain and wind action. DDT W.P. (0.75 per cent actual) and "Endrex E.C." (0.03 per cent actual) have been found to be quite effective against the pest though the latter is superior both from the point of view of efficiency and economy. The insecticidal treatment should cover the plants at least down to the ninth leaf. Even a very low concentration of "Endrex" may endanger the lives of aquatic fauna like fishes, so precaution to this effect is necessary.

RARELY TOGETHER

The yellow mite of jute is rarely found in a field infested by the jute semilooper. If the two pests happen to appear simultaneously, the yellow mite is eliminated from the field because the semilooper eats away all the tender apical leaves and the folded buds on which the yellow mite thrives.

Since the early forties of the present century, the yellow mite of jute has been becoming a major pest of jute. The nymphs and adults cause damage to the tender apical leaves by sucking the leaf-sap from the undersurface. Injury on the undersurface of the growing apical leaves results in the curling of the affected leaves. The affected leaves do not grow to their normal size and shape, turning coppery and later on deep green in colour and usually dropping down earlier. The growth of the internodal length of the attacked region is also affected and the result is a stunted crop. An early monsoon followed by an early sowing and a continued humid climate seem to favour the spread of the pest over wide areas, as was observed in 1949.

TINY SIZE

Owing to the tiny size of the pest, it is scarcely visible to the naked eye. The eggs are white and oblong-oval in shape, each measuring approximately 95μ in length and 57μ in breadth. The dorsal surface of the egg is beautifully decorated by prominent cup-shaped white tubercles, each measuring 8μ to 12μ in diameter, arranged in rows of five or six, while the ventral surface is smooth. The eggs are laid on the undersurface of the leaf-buds or the just unfolded leaves. Eggs of a parthenogenetic origin giving rise to a male population are also common. The eggs hatch in about two days.

The nymphs are very pale yellow or almost white in colour, and are rather sluggish in their movements in comparison to the adults. The nymphal period, including the active and the quiescent phases, covers about two days. The males, which emerge earlier than the females, move about in search of quiescent females, and on locating them lift across and carry them almost vertically above by means of the "sucker apparatus" at the end of the "tail" or the narrowed posterior end of the abdomen. The adults are yellow in colour. The males are polygamous in habit. They carry under the field conditions the quiescent females to the younger leaves above wherein mating and egg-laying take place. The males thus play the important role of constant shifting of the colony to the young apical leaves.

The mites can be controlled by application of lime-sulphur solution or dust on the undersurface of the affected leaves. Lime-sulphur dust in the proportion of 3 :1 has been found to be the cheapest; it is very efficient. Appearance of normal apical leaves above the curled ones is a sign of the cure of the crop. No suitable acaricide having an ovicidal value has yet been found to deal with this pest. A second treatment at an interval of 48 hours is, therefore, desirable to deal with the nymphs hatching out from the eggs laid just before the first treatment.

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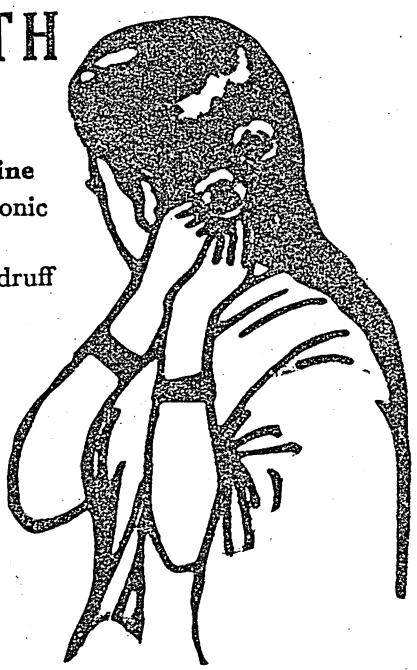
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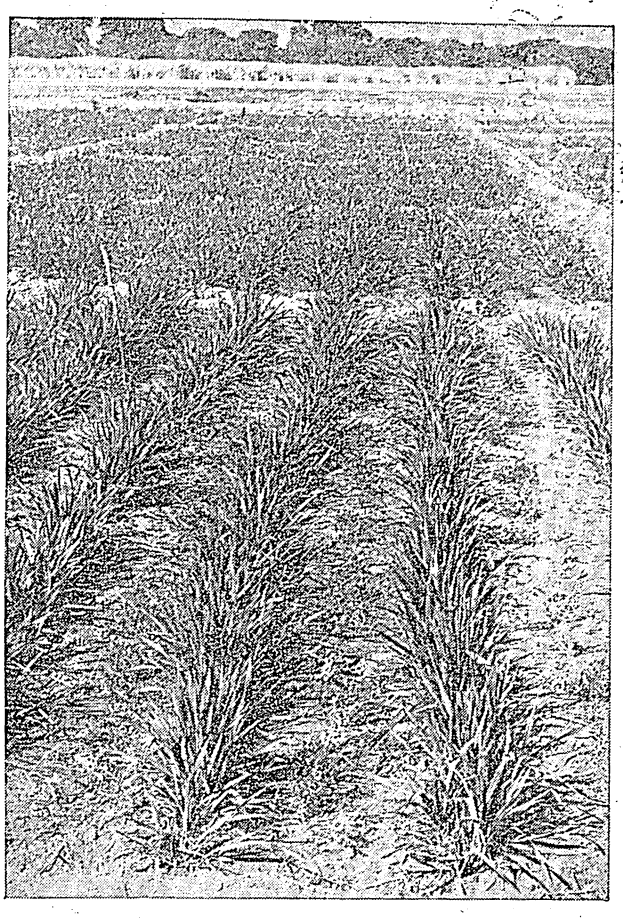
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One row of a cereal crop and one of a legume

Mixed Cropping,

Many Advantages

by
D.K. Misra
Soil Conservation Officer (Agronomy)
Desert Afforestation and Conservation Station
Jodhpur

A PRACTICE quite common in our dry-farmed areas is of raising more than one crop at the same time in the same field. This is mainly done to provide an insurance against a failure of the main crop. But mixed cropping, as it is called, has many other advantages.

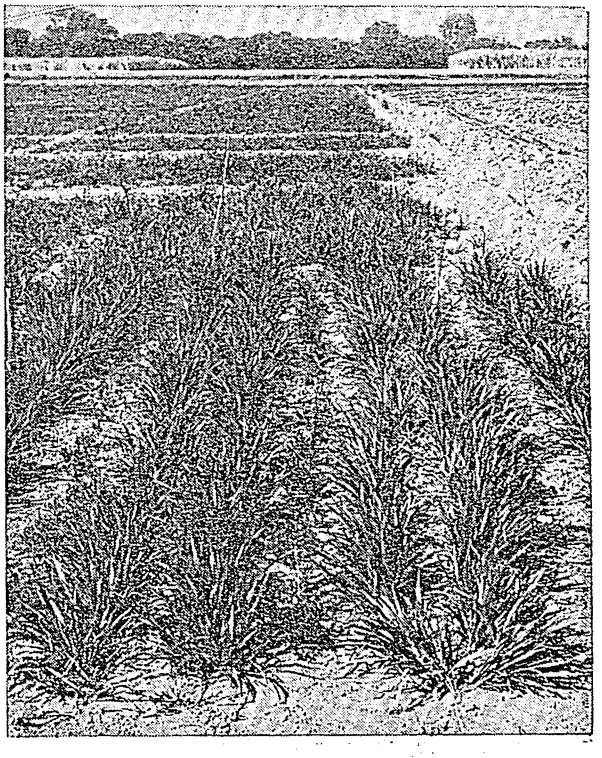
Usually, legumes are mixed-sown with cereals and this has been observed to improve land fertility to a certain extent. When several crops are grown together, the labour of the farmer gets fairly distributed over the whole year, he gets periodical returns and his needs for different grains, legumes and pulses are met. All possible space in the cropped field and plant food at all depths of the soil are fully utilized. Even in the matter of attack by pests and diseases, crop mixtures suffer less than single crops do.

Mixed cropping also increases yields. In Rajasthan, *bajra-guar*, *bajra-lobia*; wheat-peas and barley-peas mixtures have yielded ten to 25 per cent more. In the western districts of Uttar Pradesh, like Etawah, the wheat-potatoes mixture has led to an additional income of Rs. 200 to 250 per acre. Similarly, wheat-gram, wheat-vegetables, barley-gram, *bajra-guar*, *jowar-mung*, *jowar-arhar* and *jowar-guar* have given good profits. At the Poona Agricultural College and Farm, the highest returns have been obtained by growing *bajra-red* gram every year than by following other rotations. At the Guntur Agricultural Station, cotton and ground nuts have proved to be the best companions.

PERMANENT CROPS

Two permanent crops may be grown together. The most common example of this is mixed gardens of coconuts, mangoes, jacks, guavas, oranges and other citrus trees and arecanuts. Another example would be coffee grown in rows of three or six interspersed with a row of oranges and another of pepper trained on shade trees, so that three permanent crops alternate with each other.

Two rows of a cereal and one of a legume



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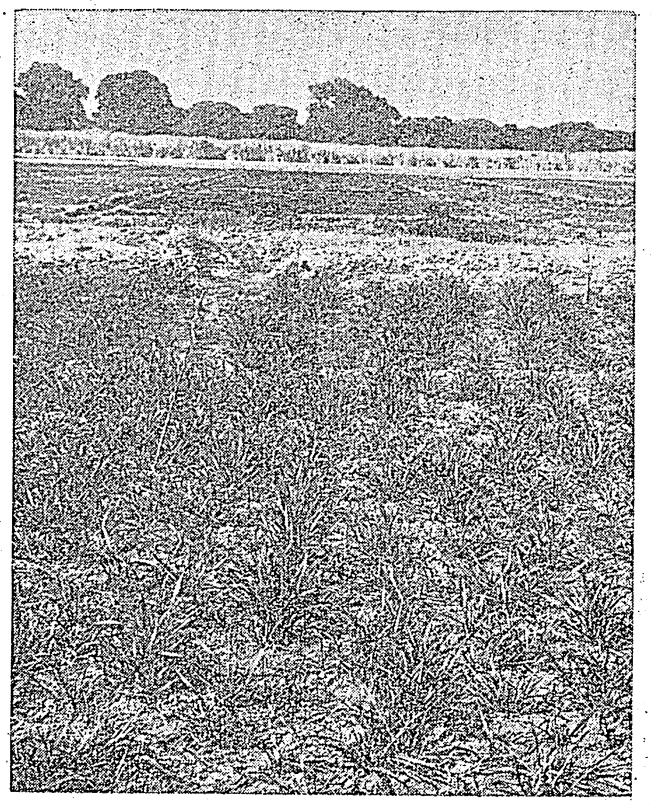
In young coconut gardens, crops of *jowar*, groundnuts or other quick-growing pulses like *urid*, *mung* or *kulthi* are taken. These crops are of a very short duration, especially in comparison with the main crop. They provide some income and at the same time keep the land covered till the main crop comes up. There is another kind, nurse crops, like Crotalaria species such as *striata*, *juncea* and other similar crops grown in between rows of young coffee plants to provide shade for the young bushes. These may be removed after a season.

MIXED ANNUALS

Growing of mixed annual crops is quite common all over the country. Cereals are usually mixed with legumes. Wheat-gram, barley-gram, *jowar* and *guar*, *bajra* and *urid*, *mung*, *moth* or *lobia*, etc., are the common crop mixtures of this type.

The methods adopted for sowing mixed crops differ in various parts of the country. In broadcasting, the seeds of the two or more crops to be sown are mixed together and broadcast all over the field without any consideration to lines or the direction.

Sometimes, the main crop is first sown broadcast and covered by a light ploughing or harrowing. Then the plough furrows are drawn at the desired distances and the seeds of mixed crops are dibbled or dropped by hand in these furrows.

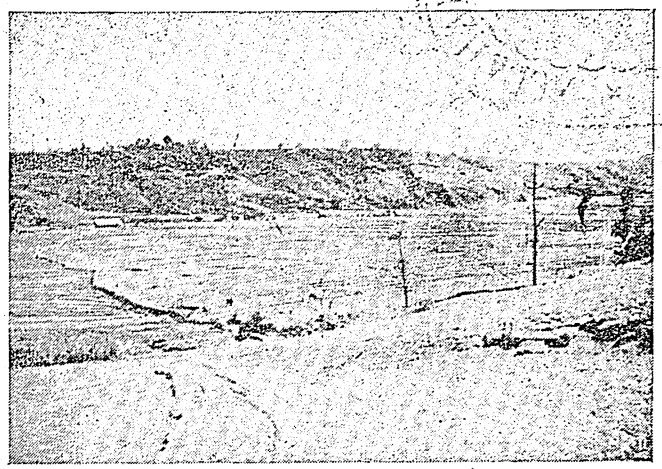


Cross-sowing of a cereal and a legume

For line-sowing, both the main and the mixed crop are sown in lines. In this system, a seed-drill is commonly used to economize on time and labour.

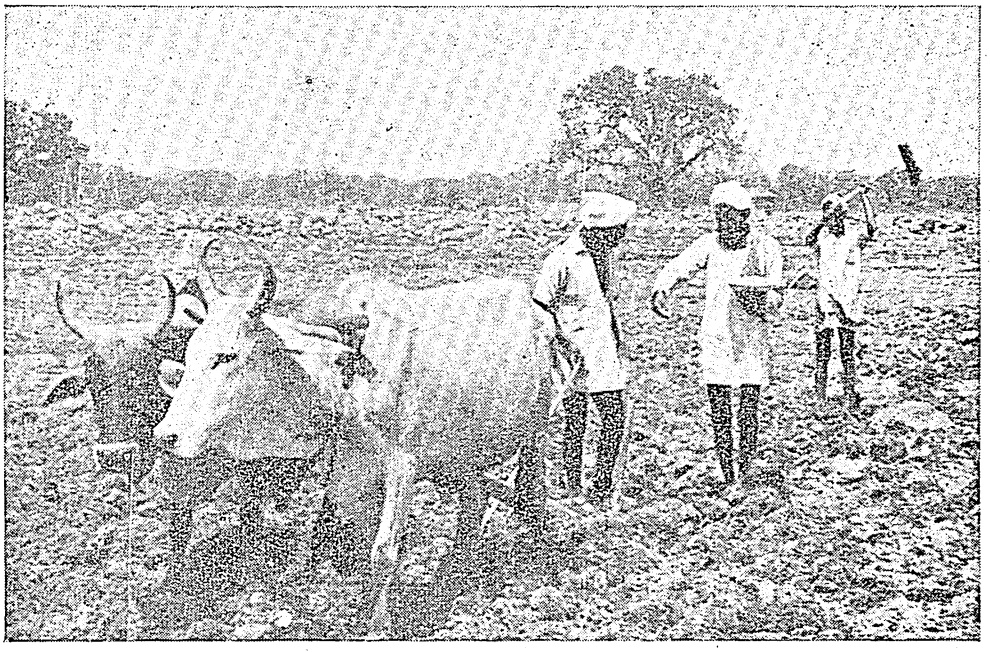
To Kangra Farmers

Rice fields in the Kangra Valley



HIGH PROFIT YOURS IF YOU FERTILIZE PADDY DEEP

Dropping ammonium sulphate deep in the furrow behind the plough. The man in the rear is breaking the clods with a wooden hammer locally called *katla*



by

Gurcharan Singh

Economic Botanist, Cereals and Pulses, Punjab, Jullundur

and

Sohan Singh Saini

Rice Breeding Substation Nagrota Bagwan

WHETHER he sows his paddy by *wattar* or transplants it, one thing is sure: the Kangra farmer will get better returns if he applies ammonium sulphate deep in the furrow rather than on the surface of the field.

With its 25 per cent of the total rice acreage of the State, the Kangra hills are a prominent rice tract of the Punjab. The soils, however, are poor and the pressure of cropping high. An 80 to 90 inches of rainfall beating on them pushes their fertility further down.

The farmers of the area quite realize this and are taking to a liberal use of ammonium sulphate to increase their paddy yields. But rice here is grown on terraced slopes at altitudes ranging from 1,500 to 5,000 feet and the fertilizer is applied as a topdressing in one to two inches of standing water. As a result, it is washed away by the heavy rainfall and the water flowing from one terrace to the other. It has been estimated that about 20 to 25 per cent of the fertilizer remains in the surface water 48 hours after application; this quantity is reduced to ten to 12 per cent after six to ten days of application.

This is a considerable loss. Experiments were, therefore, undertaken at the Rice Breeding Substation, Nagrota Bagwan, District Kangra, to see how paddy grown under Kangra conditions responded to deep application of ammonium sulphate. Deep application was tried both under the *wattar* and transplanting methods. The Station is located in the heart of the Kangra Valley at an altitude of 3,000 feet and has an annual rainfall of a 100 inches.

Under transplanting, five to six weeks old seedlings were transplanted into a well-puddled field from the end of June to the beginning of July. Thereafter, water

was kept flowing in the field till maturity. Transplanting is very limited in the Kangra Valley for want of adequate irrigation facilities and availability of labour.

THE *WATTAR* METHOD

In the *wattar* method, paddy seed was sown broadcast in a well-prepared field having sufficient moisture to ensure a good germination, from the middle of May to the middle of June. The crop was allowed to grow under dry conditions thereafter.

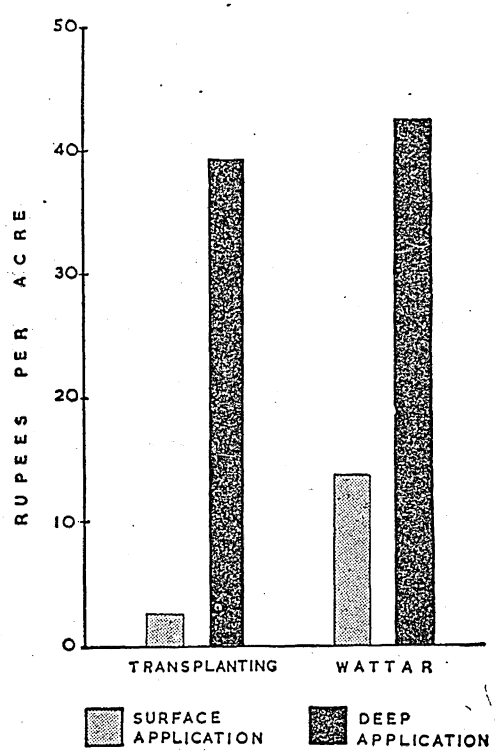
With the break of the monsoon in the beginning of July, the field was ploughed in ankle deep water standing in it. This process is locally called *hodding* and destroys weeds and stimulates growth of the rice plants. After a thorough weeding, plants in the field were properly spaced out and gaps created by the plough filled up. After this, water was kept flowing in the field till maturity. About 80 per cent of the area in the hills is sown by this dry-broadcast method.

HIGH PROFIT

The fertilizer in both the methods was placed deep in the furrows by dropping it by hand behind the plough at the time of the last ploughing. This was done before adding water to the field in transplanting and just at the time of sowing in the case of *wattar*. In surface application for comparison, the fertilizer was broadcast in about two-inch deep standing water about 15 days after transplanting and about ten days after *hodding* and spacing out of the plants in *wattar*. A dose of 25 pounds nitrogen per acre in the form of ammonium sulphate was used. The average yields obtained are given below.

Treatment	Transplanting			"Wattar"		
	Yield per acre in lb.	Increase over control		Yield per acre in lb.	Increase over control	
		Per acre in lb.	Per cent		Per acre in lb.	Per cent
Deep application	3,475	511	17.24	2,743	534	24.17
Surface application	3,152	188	6.34	2,490	288	12.72
Control (no fertilizer)	2,964	-	-	2,209	-	-

It will be seen that deep application in dry soil before flooding or sowing leads to the most efficient utilization of the fertilizer under Kangra Valley conditions. After taking into account the extra cost on labour required for placing the fertilizer in the furrows, the net profit left to the farmer stands quite high. It is Rs. 39.32 per acre in the case of transplanting and Rs. 42.04 by *wattar* under deep application; the corresponding figures under surface application are Rs. 2.56 and Rs. 13.72.



Net profit obtained by deep application of fertilizer

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by
Kartar Singh Chela
Block Development Officer
Jagraon, Punjab

THAT the maize crop prefers the quick-acting artificial fertilizers to the slow-going organic manures, has been shown by experiments in the Punjab. Of the fertilizers tried, ammonium sulphate has proved to be the most economical to use.

The average maize yield in India is 535 pounds per acre. Compare it with the 2,760 pounds of the Netherlands and New Zealand and 2,141 pounds of the U.S.A. Our low figure has been the result of absence of good varieties, unimproved cultural practices and, above all, lack of information on the manurial requirements of the crop.

Experiments were, therefore, conducted for two years at the Government Agricultural Farm, Jullundur, to find out the most effective and economical manures for this crop. Organic manures like farmyard manure and groundnut cake and artificial fertilizers like ammonium sulphate, ammonium phosphate and superphosphate were tried.

The soil on which the experiment was laid out was of a medium type. The popular maize-wheat rotation was adopted. The variety used was the local yellow flint.

A basic dose of five tons of well-rotted farmyard manure was applied to the field. The crop was sown in the middle of July. The distance from row to row and plant to plant was kept at one foot.

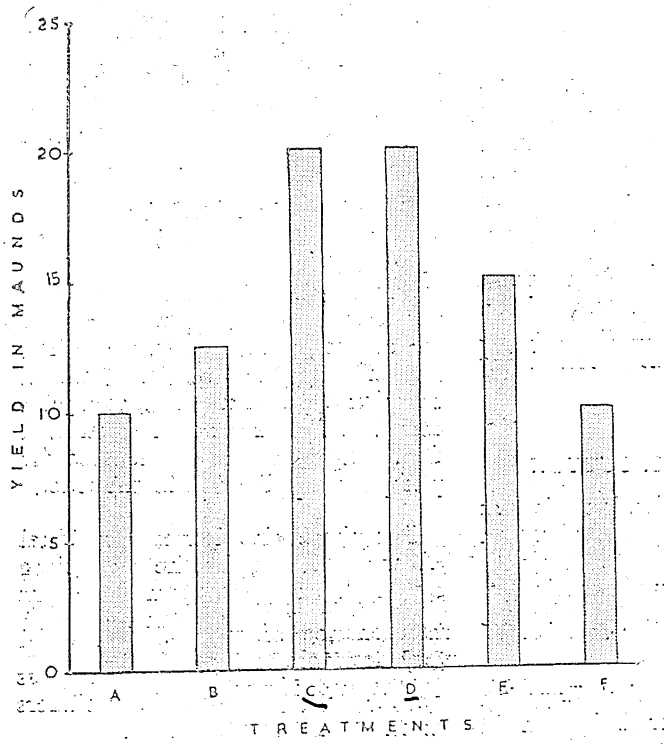
Farmyard manure and groundnut cake were applied to the plots at the rate of a 100 pounds nitrogen per acre (12 tons and 26.08 maunds, respectively) before sowing. The manures were spread over the plots uniformly and then mixed thoroughly with the soil by ploughing. Superphosphate at the rate of 125 pounds phosphoric acid per acre (7.6 maunds) was drilled before sowing. Ammonium sulphate and ammonium phosphate at the rate of a 100 pounds nitrogen per acre (six maunds and 7.6 maunds, respectively) were broadcast alongside the rows in two doses in the second and fourth weeks of August.

The highest average yield of grain as well as stalks (20.06 and 37.30 maunds per acre, respectively) was obtained with ammonium phosphate (containing a 100 pounds nitrogen and 125 pounds phosphoric acid) followed closely by ammonium sulphate (19.33 and 34.31 maunds per acre, respectively). The groundnut

CONTD. ON NEXT PAGE

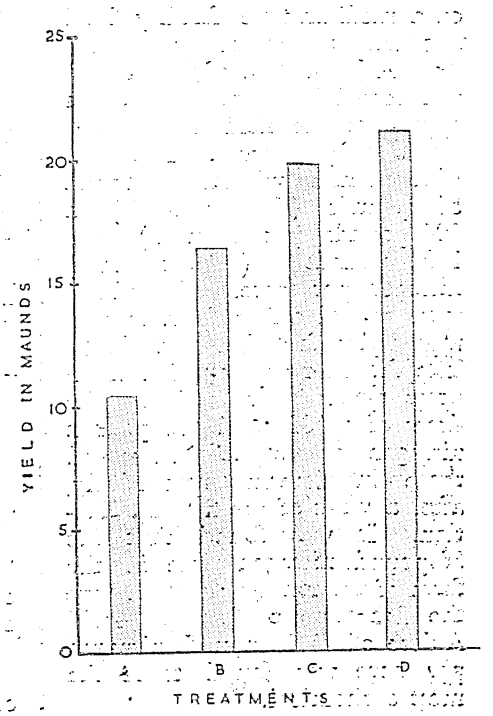
AVERAGE YIELD OF GRAIN OBTAINED BY APPLYING DIFFERENT MANURES

A. Control
B. Farmyard manure, 100 lb. N.
C. Ammonium sulphate, 100 lb. N.
D. Ammonium phosphate, 100 lb. N.
E. Groundnut cake, 100 lb. N.
F. Superphosphate, 125 lb. P_2O_5



AVERAGE YIELD OF GRAIN WITH DIFFERENT DOSES OF AMMONIUM SULPHATE

A. Control
B. 50 lb. N.
C. 100 lb. N.
D. 150 lb. N.



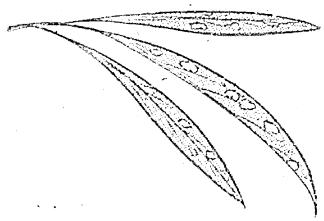
CATERPILLAR OF CARDAMOM

CARDAMOM planters can effectively deal with the leaf-eating hairy caterpillar of cardamom if they take timely control measures, studies in Mysore and Madras States reveal.

Spraying with "Folidol-E 605" at 0.1 per cent concentration has been found to paralyse the caterpillars in five to six hours and kill them in about 24 hours. Similarly, "Parathion" 0.05 per cent an ounce in five gallons of water paralyses and kills the caterpillars in 24 to 36 hours. The effect of this insecticide lasts for a week.

The Parathion compounds, however, are highly poisonous and should be handled very carefully.

Spraying with *honge* oil rosin soap or fish oil rosin soap (a pound in ten gallons of water) has been found to effect a cent per cent mortality of the caterpillars in 24 hours. These are cheap and effective poisons without any residual effect. Spraying with DDT 50 per cent W.P. (a pound in 16 gallons of water) has also been found to be very effective.



Collecting and destroying the pupae is perhaps the cheapest and the most effective method of control. From January onwards, the pupae should be collected, piled up in heaps together with dry leaves and burnt. If a congregation of the insects is disturbed, all of them would drop down automatically. The falling caterpillars can be received in basins containing kerosenized water.

AMMONIUM SULPHATE FOR MAIZE

CONTD. FROM PREVIOUS PAGE

cake was better than no manure at all and farmyard manure also had some effect, but superphosphate alone did not show any results.

Ammonium sulphate gave the highest net profit of Rs. 26.80 per acre; ammonium phosphate was the second best in this respect with Rs. 14 per acre. Farmyard manure, groundnut cake and superphosphate actually showed losses. As ammonium phosphate is not easily available and also costs more, ammonium sulphate is the fertilizer for maize.

To find out the optimum dose of ammonium sulphate for maize on a medium type fertility land another experiment was taken up. A basic dose of five tons of well-rotted farmyard manure was applied to the field about three weeks before sowing. The doses of ammonium sulphate tried were 50 pounds (three maunds), a 100 pounds (six maunds) and 150 pounds (nine maunds) nitrogen per acre. The plants were spaced a foot from row to row and a foot between plants. The fertilizer was applied about three weeks after sowing. The doses of a 100 and 150 pounds nitrogen were applied in two and three instalments, respectively, after a week of the first application. It was found that the 50-pound nitrogen dose in the form of ammonium sulphate gave the highest net profit of Rs. 45.93 A dose of 77.25 pounds nitrogen per acre was found to be the most economical.

PHOSPHATE FOR COTTON

PHOSPHATE application is as necessary for heavy yields of cotton as nitrogen or potash. This is brought out by results of experiments conducted in various parts of the country.

Investigations on the Egyptian cottons grown under irrigation in the Mysore State under a scheme financed by the Indian Central



Cotton Committee have shown that deficiencies of phosphate and potash are the chief causes of the lack of response to nitrogen application and the low yields of these cottons. Application of a 100 pounds each of potash and phosphate was found to increase the yield of these cottons by about 200 to 300 pounds per acre, thus making their cultivation remunerative.

Experiments on the Babbur Farm also revealed almost a similar trend in yield. Here, phosphate alone increased the yield to 503 pounds per acre as against 476 pounds of the control, while potash alone had no effect. The results from a complex experiment conducted with complete fertilizer at Dharwar and Gadag again indicated the need for phosphate application in the tract.

Phosphate also leaves a residual effect which benefits the succeeding crops. Thus, both from the point of view of crop production and maintenance of soil fertility, it is very desirable to lay as much stress on the use of phosphatic fertilizers as on the nitrogenous ones.

by **H.C. Malik**

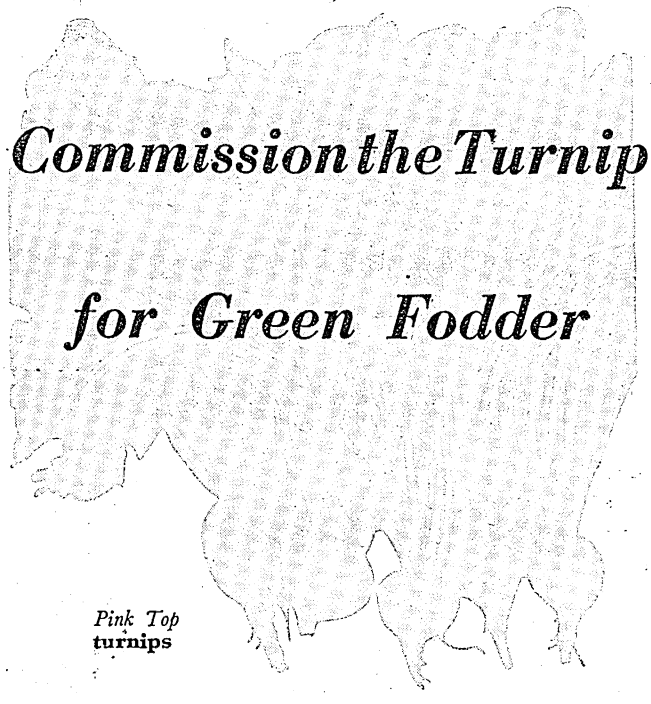
A. Economic Botanist Fodder, Punjab, Sirsa

Commission the Turnip for Green Fodder

WHEN *kharif* fodders are out of the field and the *rabi* ones are still taking root, turnips can come in quite handy. They can help you tide over this gap in your green fodder supply. What's more, they contain a lot of nutrition and an acre of them could supply 400 to 700 maunds of green stuff for your cattle.

A turnip crop mainly for feeding cattle is yet a rare sight in the Punjab State. This has probably been due to the absence of a variety labelled "for fodder," which has to be larger, coarser and higher-yielding than the vegetable types. The need for such a variety was highlighted by a heavy demand from displaced persons resettled on land.

Five turnip varieties—*Red Palampur*, *Partially Pink*, *Green Top*, *Pink Top* and *Pink*, were, therefore, tried at the Fodder Research Station, Sirsa, from 1955-56 to 1957-58, for the purpose of selecting the best fodder type. In the trials, *Green Top* turned out to be the best by giving an average per-acre yield of 612 maunds, with *Pink Top* coming as a close second with 563 maunds.



Pink Top **turnips**

Turnips can be raised with ease on a rich, loamy soil which responds very well to fertilizers. The seed at two to 2½ seers for the acre is sown broadcast in a well-prepared moist soil in September-October. The crop is ready for harvesting in the end of November or early December, generally prior to berseem. Turnips, therefore, are not only a heavy-yielding forage crop, but also an ideal catch crop which takes very little time to get ready.

A satisfying look back at the first five years of



THE DELHI INTENSIVE CULTIVATION SCHEME

by

P. C. Raheja

and

A. R. Khan

Indian Agricultural Research Institute, New Delhi

IN 1950, the Indian Agricultural Research Institute, New Delhi, launched a pilot Scheme of Intensive Cultivation in 19 villages of Delhi State. The aim was to lift the agriculture of the area out of the usual rut of low yields by conveying to the farmers the latest findings of research and helping them in an efficient utilization of their resources. The successful working of the Scheme during its first five years augurs well for the achievement of its ultimate objective.

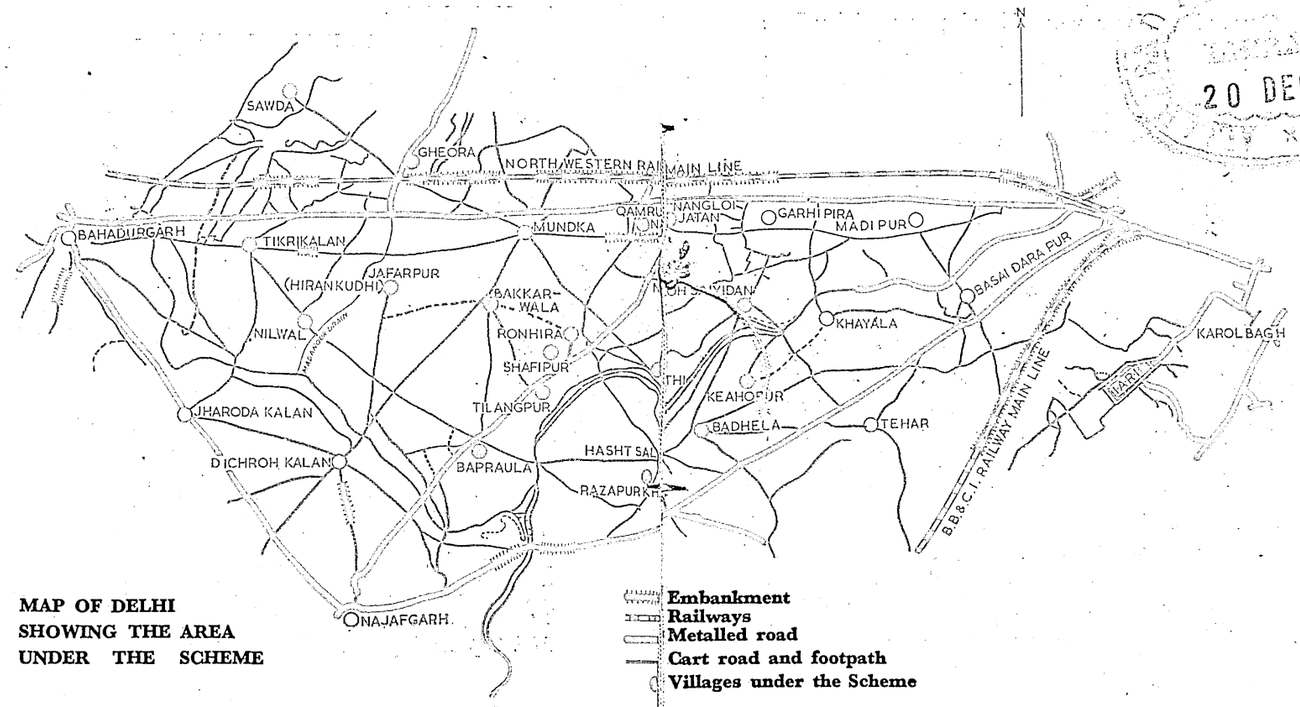
The programme of work included: demonstration of improved varieties of crops and gradual saturation of villages with them ; examination of varietal purity and roguing ; demonstration of form, method and time of applying manures and fertilizers to crops and vegetables ; demonstration of improved cultural practices with improved implements and machines ; demonstration of the methods of pest and disease control ; survey of the land for its proper utilization ; all-round development of a model village and introduction of a Land Army for assisting in development work.

The plan of action was first to lay an emphasis on demonstration of improved varieties and remunerative practices and bring about a close contact between the workers and the cultivators, and then to follow it up with "saturation" of the area with improved varieties.

To begin with, a comprehensive survey of the agricultural resources of the area and the prevailing farming practices was carried out. The 19 villages



aruddin farmers learning the use of hoes for interculture



MAP OF DELHI SHOWING THE AREA UNDER THE SCHEME



Wheat *N.P. 718* (*right*) has been fast replacing the local varieties, such as *C. 591* (*left*)



Fertilized crops, such as the one of *bajra* on the right, grown side by side with unfertilized ones spread their own message

selected cover an area of 24,500 acres. About 32 per cent of the cultivated area is under irrigation from the Western Jamuna canal or wells. The principal crops of the area are *jowar, bajra*, wheat, barley, gram and tobacco. Vegetables are grown both for the home and the market. Paddy and sugarcane are also grown in a few villages where irrigation is available.

Majority of the cultivators possess holdings varying from eight to 16 acres. Those who have less than this are generally share croppers. The country plough and the wooden beam are the only two implements used.

Land vacated by wheat, barley and gram under rain-fed conditions is given a summer cultivation. The heavy land under irrigated wheat which becomes hard for dry ploughing is left unploughed till the monsoon sets in. The land thus cultivated is left open.

Pulses are stored mixed with sand or ash to avoid an attack from pests. Wheat, barley, etc., are stored in special enclosures of matting locally known as *theka*. A bedding of sand, *nim* leaves or wheat *bhusa* is put on the floor and the grain is put into the enclosure. The top is covered by a piece of cloth.

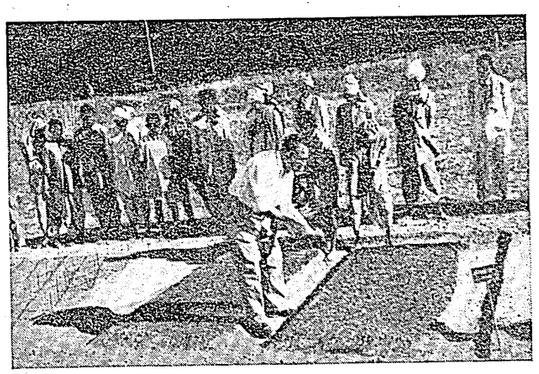
Japanese weeders a common sight wherever paddy is grown in the area



DEMONSTRATIONS ARRANGED

Realizing that merely the spoken word did not mean much to the farmer, a large number of demonstrations to drive home to him the advantages of improved

Demonstrating how to raise nursery in the Japanese method of rice cultivation



varieties, new cultural techniques and methods of plant protection were arranged on cultivators' fields. An average of 20 such demonstrations per village were conducted.

Demonstrations on the methods of seed selection, nursery-raising and roguing of fields for maintaining purity of improved strains were arranged. Germination tests on seeds of wheat, oats, barley, peas and berseem were carried out prior to their distribution. The area under *N.P. 718* alone rogued out during 1954-55 was 239 acres.

To augment the methods further, leaflets containing information on various aspects of improvement were freely distributed. An agricultural museum was set up at the Scheme headquarters at Nangloi. Farmers' meetings were arranged, once in every quarter in the villages of the scheme and at the Institute, to provide contacts between the cultivators and the researchers.

SEED MULTIPLICATION

To speed up the process of agricultural improvement, large, compact blocks were selected for seed multiplication by sowing high-yielding improved varieties. These were given special attention in respect of manuring, weeding, irrigation, control of pests and diseases, etc. The seed thus produced was utilized both for demonstration and sale.

On account of its outstanding characteristics such as smut-resistance, rust tolerance, low irrigation requirements and early maturity, *N.P. 718* has carved for itself a special place in the economy of these villages. In 1954-55, an additional production of 1,800 maunds was obtained with this variety, which meant an additional per-acre profit of about Rs. 64 compared to the old and established variety.

High-yielding varieties find their best expression in suitably fertilized fields. With this object in view, fertilizer demonstrations were arranged.

Improved implements for hot weather cultivation, burying green manure crops and threshing and winnowing were loaned out to farmers. Farmers were assisted in the threshing of wheat, shelling of paddy and polishing of rice.

PLANT PROTECTION

Control operations against insect pests, such as *kutra*, *phadka*, *pyrilla*, red pumpkin beetle, *gundhi*, termites, cutworms, etc., and rodents were undertaken by dusting of "Gammexane" and fumigation with cyanogas, respectively. The highlight of the operations was the destruction of locusts which laid eggs twice—once in July and again in October, 1954. To control seed-borne diseases and improve germination as well as the stand of crops, seeds of some crops were given fungicidal dressing treatment with "Agrosan G.N."

Qamruddin Nagar was selected as a model village for all-round development in the block. The targets of land transformation were fixed over a period of ten years for raising crop-yields, upgrading the fertility of the land, introducing labour-saving implements and machines, laying out orchards, planting fuel trees, composting village refuse and conserving moisture. These targets were duly achieved year after year and in some cases even exceeded.

LAND ARMY

Land Army units comprising, besides farmers, staff and students from the Institute and the Central College of Agriculture, were formed. Compost pits were dug, trees planted, pernicious weeds eradicated, control operations against pests and diseases undertaken, bunds erected for conserving water and approach roads were constructed by the Army.

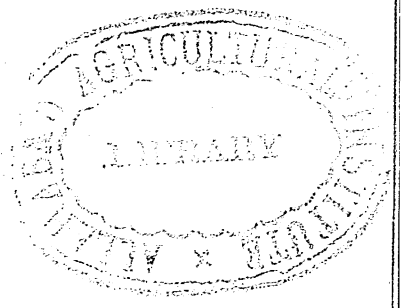
A survey for determining soil types and recommending land use, etc., was carried out. A number of samples of well water were collected and analysed. In addition, a systematic examination of wells in Qumruddin Nagar was also taken up. Intensive soil and water conservation methods were adopted in Qamruddin Nagar.

Perhaps the greatest achievement of the Scheme has been the infusing of confidence among the farmers that they can better their lot. It is this feeling of confidence that has been adding momentum to the process of agricultural improvement in these villages. Silently, but surely, these 19 villages of Delhi are advancing towards an era of plenty and prosperity.

When locusts came into Delhi in 1954, prompt action was taken to destroy them



The Way I Grow Wheat



by
Kartar Singh "Dewana"

EVER since I was awarded the first prize for the highest wheat yield of 56 maunds 10 seers per acre in the crop competitions held in Pepsu a few years ago, many have asked me as to how I raised the crop.

The factors to which I paid particular attention in raising my prize-winning crop were: a thorough preparation of land, adequate use of manures and fertilizers, selection of good seed, proper irrigation and timely hoeing. A suitable crop rotation is also important, such as wheat raised after cotton or sugarcane or *guara*.

I raised my crop in a field which had borne berseem after cotton.

The last cutting of the berseem was ploughed in as green manure. Then the field was given a good number of ploughings, farmyard manure at 15 cartloads per acre added to it, and the field levelled with the *sohaga*. In the beginning of October, superphosphate was drilled at two maunds per acre. Then, another *sohaga* and one more ploughing were given. About the middle of the month, a good *rauni* irrigation was applied. As the soil dried up at the surface, it was slightly hoed. Thereafter, it was ploughed first with the *triphali* and then, after using the *schaga*, twice with the *desi* plough. It was again followed by the *sohaga*.

The crop was sown with a cotton drill at a seed-rate of 35 seers per acre, after broadcasting ammonium sulphate at 30 seers to the acre. *C. 518* was the variety used, the seed of which I had raised on my own farm.

I should say that half the success in raising a good crop depends upon using the right type of seed. For delayed sowings, I would recommend *C. 228*. If you save your own seed, select good, plump seeds by the floatation method.

Five weeks after sowing, weeds were removed and the first irrigation given simultaneously. Ammonium sulphate mixed with earth was then broadcast at 30 seers per acre. As soon as the land was in *wattar*, it was bar-harrowed. A vigorous-growing crop was seen coming up.

The crop was slightly topped during the later part of December. Then, a few showers were received. In all, four irrigations were given to the crop. Unfortunately, the crop lodged after the last irrigation and that affected the yield to some extent.

STORING THE PRODUCE

I have always felt that our farmers pay scant attention to storing their produce which is the result of such hard labour. The produce stored in bags should be mixed with a pound of "Gammexane" for every 30 maunds of grain to save it from grain-eating insects. Thereafter, the bags should be dusted with "Gammexane" from time to time. To store the wheat loose, an open cement-trough may be used. But "Gammexane" must be mixed with it. The stored grains should be covered with a *khes* or Hessian. An occasional dusting with "Gammexane" is necessary. Grains stored this way must be washed with water before consumption.

Before concluding, I would also like to tell how I prepare farmyard manure for my crops.

GOOD MANURE

All the farm wastes such as dry sugarcane trash, maize and wheat stalks, mustard stubble and trimmings and dry leaves from the garden are collected and spread in the cattle-shed for about five days. Thus, the refuse gets saturated with dung and urine which get well-mixed with it by constant trampling by the animals. After this, the entire stuff is removed to the manure pit.

The filled pit is covered with a three to four-inch layer of earth and sprinkled over with water from time to time. Sprinkling of water is a *must* in summer.

The manure is turned with a spade after about four months. A bag of superphosphate is dusted over it, and it is again covered. One can dispense with superphosphate if it is not available.

A second turning with the spade after another four months prepares this manure for use in the field. I have found that the manure thus obtained is three times as rich as manure prepared in the ordinary way.

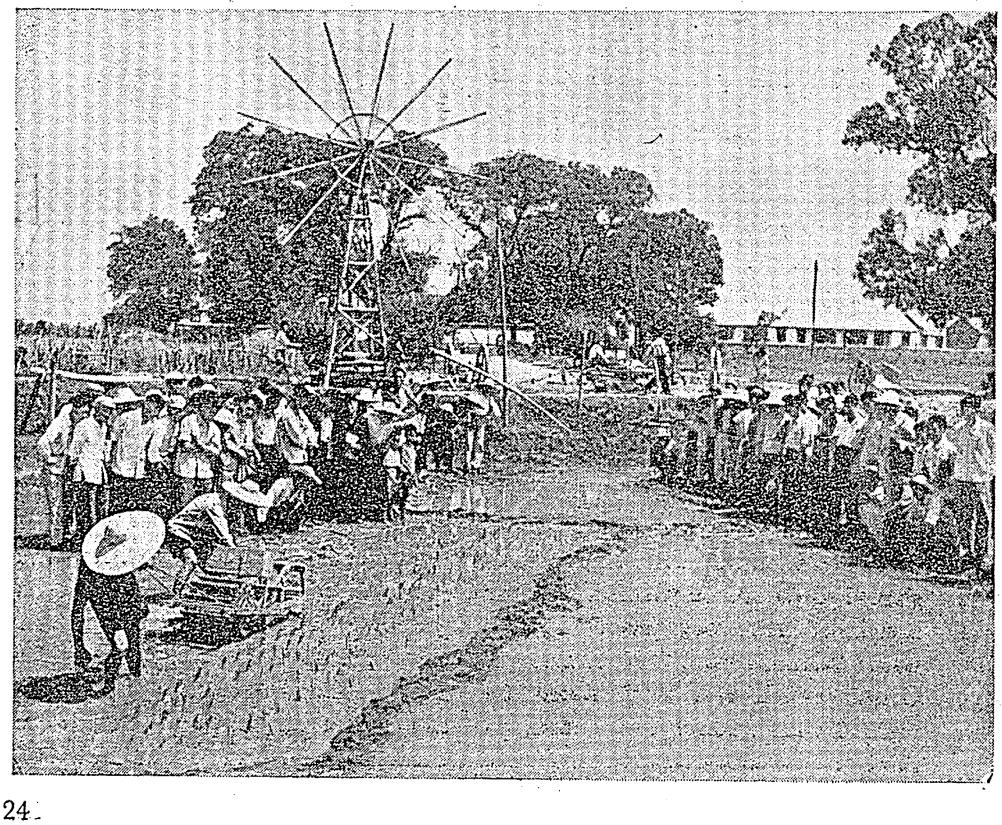
China's Aim: An Improved Implement For Every Job

by
Hsieh Ying-chi

IT is estimated that during the past few months, farm implements innovated and improved in China came close to a 100,000 types. These included cultivators, water conservancy equipment, drainage and irrigation pumps, carts and other means of transportation in the countryside, devices for the protection of plants and crops, animal husbandry implements, machines and tools for the processing of agricultural produce, power machines, and forestry and other forms of farm implements. More than 67,000,000 pieces of these improved or newly-invented implements have been adopted for use throughout the country.

In order to guarantee the achievement of the targets set for the big "leap" for grain, cotton and other agricultural products, the Chinese peasants found it necessary to build more water conservancy projects, accumulate more fertilizers and improve the soil to increase farm output. These called for many hands and the problem of the shortage of manpower suddenly appeared in the countryside. For example, on a rough estimate, the Hunan province needed 4,400 million workdays to accomplish its targets. Taking all its 12 million regular workhands into account, each had to put in 360 work days from November, 1957 to June, 1958. Obviously, it was impossible to achieve the goal by the old methods. A vigorous, nation-wide campaign to improve the antiquated and old-fashioned farm tools, therefore, developed on an unprecedented scale. As farm activities change with the season, new and improved

A farmer of the Kwangsi Chuang Autonomous Region demonstrating the rice-transplanting machine invented by him



implements have appeared in practically every phase of the country's agricultural life.

SIMPLE AND CONVENIENT

The various types of farm implements invented and improved by the masses range from man, animal, water, wind to machine-driven types and every one of them has these features: it is simple to make, is light and convenient to handle and can be made from available local materials. And, although they are low in cost, they are high in productivity.

For example, the automatic foot-powered tamping machine invented during the building of the Puhsiang Reservoir at the Chutsing country in the Yunnan province needs only two men to operate instead of eight in the old way, raising efficiency three-fold. Yet each tamper costs only 12 yuan (a yuan=about two rupees).

The three-wheeled ox-cart made by the Fanghung Farm Co-operative of the Tienfa village at the Laian county in the Anhwei province is well-adapted to carry earth over long distances. It can automatically empty its load and needs only a man and a cow to operate it, raising efficiency about five to six times.

An overhead contraption suspended across the valley as devised by Tuan Cheng-chiu, a functionary of the Hsinchieh Co-operative at the Kuta county in the Hunan province proved very efficient in transporting earth or fertilizer in hilly regions by sliding it up or down the rope in baskets instead of carrying it on human shoulders, raising efficiency 15 times and involving very little expense.

The sprinkling apparatus devised by Chiang Yun-chung, a worker at the Kanku county farm implement factory of the Kansu province, is capable of raising the water level to as high as 20 metres. It irrigates 40 *mu* (a *mu*=0.1647 acres) of land a day and uses about 50 per cent less water than the regular way of irrigation. It is particularly suitable for hilly districts as no running of earth will result from it.

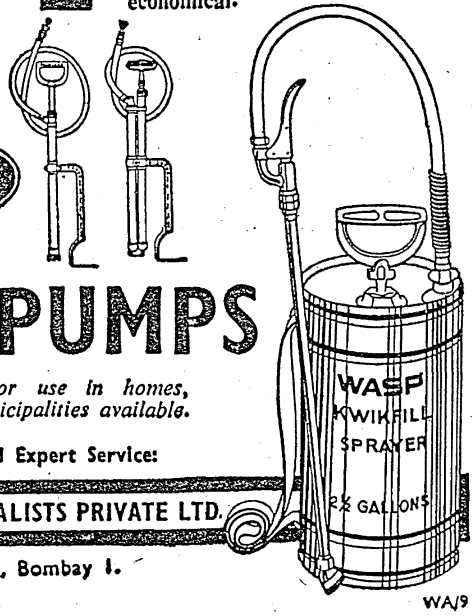
The treadle fly-wheel pump made from spare parts of an old loom and the frame of a cotton gin by Hsin Hsien-chou, a carpenter of the Tatung-chuang United Co-operative's carpentry group, costs about ten to 15 yuan, cheaper than a five-wheel waterwheel by 50 yuan. It can irrigate about ten *mu* of land a day, more efficient than the five-wheeler by two to three times. One can read while operating it, so the peasants call it "semi-mechanized."

The two-deck double-shared plough devised by Wang Yu-shun of the Hsien-chin No. 1 Co-operative at the Tsengfumiao village of the Changko county in the Honan province can plough three to 3.5



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mu of land at a depth of 1.2 to 1.5 feet a day, raising efficiency four times when compared with human power.

Chen Yen-tsing of the Chenchi county in the Kwangsi Autonomous Region invented a rice-transplanting machine which automatically "picks" and plants rice-shoots at the rate of a *mu* per hour, bettering the effeciency of transplanting by hand ten to 12 times. Its construction is simple and can easily be copied, costing a little over 20 yuan, as most of it is made of wood.

The small rice-transplanting boat made by the Kueishan Co-operative of the Tasha township in the Hsinhuei county, Kwangtung province, is a boon to peasants as they can now transplant rice-shoots seated instead of bending their backs all day long. Efficiency goes up 20 to 30 per cent. It costs only a yuan to make and can be used for spreading fertilizer over paddy fields as practised in some localities.

The No. 5 Bumper-Crop Co-operative of the Tichang township, Hangyang county, Shensi province, made a wooden double-row cotton seeder capable of sowing 25 to 30 *mu* per man/animal/day. It is light and easy to manoeuvre, costing about 16 yuan.

HIGH UTILITY, LOW COST

Li Shu-ching, a member of the Kechun Farm Co-operative in the Wuchi township, Wuan county, Homei province, devised a four-purpose cultivator after making a study of a three-tooth one. It not only can sow grain and cotton seeds, but has proved handy for intermediate cultivation, distribution of fertilizer and wiping out insect pests. Though its utility is high, its cost is low.

Wang Shu-chin of the Hainying Farm Co-operative at the Hsinyang township of Tengfeng county, Honan Province, cleverly innovated a water-mill from a horse-drawn millstone and the frame of the "Liberation"type of waterwheel. Two persons operating it will turn out ten times more flour than animal-drawn millstones. Compared with man-powered ones, efficiency stands 20 times higher. In periods of drought, it can be used for irrigation by taking off the frame. It is very cheap too.

The Chihsin village of the Itu county in Hupei province built a hydro-automatic mill for continuous processing of grain. It has eight sets of equipment comprising twelve pieces such as stone roller, pestle, millstone, large sieve, watermill and their related parts which can handle all phases of milling rice and other cereals. It saves more than 4,000 men and 3,000 animals a year.

TRACTORS GALORE

Besides the innovations enumerated above, local industrial units have also manufactured well over a hundred types of tractors in spite of their poor equipment. Revolutionary internal-combustion pumps for irrigation and drainage were built in Peking and then in Tientsin. The Chinghai county of the Hupei province has succeeded in building power stations by utilizing the small differences in the water-levels on the plains. The Hupei and Kwangtung provinces have widely introduced the use of methane for generating electricity, cooking and lighting for homes by building cellars for fermentation and storing up the gas.

These are but a few examples of what the masses have innovated and improved during a record time. The Changko county invented and innovated 138 types of implements and popularized over 70,000 items within two months. After learning that the Paoma township had begun to transport everything on wheels overnight, the whole of the Tangyang county in the Hupei province followed suit within five days: 13,195 persons in the county offered 13,817 suggestions, 25,742 persons took part in making implements and 1,885 functionaries built 2,488 tools.

MANPOWER SAVED

The shortage of manpower in various localities found partial or complete solution in this way. Figures from the Honan province show that during this year's big leap in production an increase of 8,700,000,000 workdays over the previous year was needed, and the innovation of farm implements alone cut it down by 50 per cent. In the Changning county of the Hunan province, labour shortage was above 40 per cent, but after farm implements had been improved, 21,000,000 workdays were saved, satisfactorily meeting the demand for manpower. The Paoma township of the Tangyang county in the Hupeh province gained 160,000 workdays through the campaign. This not only did away with the shortage of manpower, but spared extra hands. They revised their 1958 targets upward—rice from 600 to 1,000 catties (a catty=1.1023 pounds) per *mu* and cotton from 60 to a 100 catties per *mu* of land.

Those who have invented or innovated thousands upon thousands of farm implements during the campaign are not specialists in any way nor people with a good education, but are ordinary peasants and handicraftsmen. The majority of them do not have enough knowledge or culture, but they have rich practical experience and knowledge in farm production. The campaign is still spreading and every day all types of new implements are appearing in various parts of China. The number of new tools adopted for use by the peasants is rising sharply.

Although the farm implements innovation campaign marks only the beginning of technical reform in agriculture, it has prepared the material and technical conditions for changing Chinese agriculture on a modern mass

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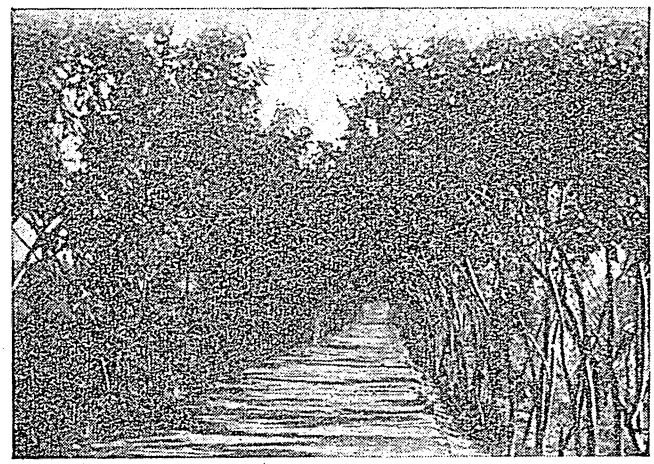
New Life to Three Lakh Acres

LIBRARY

by
M. Rayappa Pillai
and
M. Charles Ratnaswamy
Agricultural Research Station
Bhavanisagar



Papayas and tobacco coming up well at the Bhavanisagar Research Station



A Gliricidia avenue greets you as you enter the Station premises

A THREE-LAKH acre stretch of undependable land in the Coimbatore district of Madras State is slowly getting to bristle with crops. It promises to offer an additional production of about 1,30,000 tons of foodgrains and 50,000 tons of cotton in the next few years. It is the Lower Bhavani Project that is bringing about this change.

The problem of the area was a very low annual rainfall. The result was either vast stretches of land covered with thorny bushes and pebbles, or fields bearing stunted crops. The economy of the tract was, therefore, collapsing and a tendency on the part of the farmers to seek alternative vocations steadily developing.

Plans were, therefore, drawn up to build a reservoir and utilize the waters of the Bhavani river passing through the tract for irrigation. A soil survey of the entire area was taken up as early as 1934. The purpose was to know the composition and condition of the soils and their suitability for irrigation. Also, experiments on selected farmers' fields were conducted. It was concluded that the project would prove a success because the irrigation water was of excellent quality. Also, the open nature of the soils would permit free drainage and discourage the rise of salts from lower layers.

TWO SOIL TYPES

There are two types of soils in the Project area; the shallow and dryland soil (the major soil of the tract) and the garden land soil occurring in the depressions between elevations. The shallow red soil is lateritic and highly porous with a low water-holding capacity. It is also poor in all the essential plant nutrients.

The soil colour is uniformly red, but in the garden land areas the profile shows deeper and more friable soils. The parent rock, gneiss, is usually reached at the third foot, but just above it is a layer of friable weathered rock.

To help the farmers of the Project area in the agricultural problems that they might face, the Madras Agricultural Department started an Agricultural Research Station at Sathyamangalam (later shifted to Bhavanisagar) in 1951. At the Station, studies on the frequency and quantity of water required for crops, rotation of crops, soil amelioration, suitable methods of manuring, strains of crops suitable for the tract, proper

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time of sowing of different crops and spacings required for crops are being conducted. The results so far obtained indicate a promising future for the Project farmers.

The dam has been built across the Bhavani river at a place where the river Moyar joins the Bhavani river twenty miles east of Mettupalayam. It has a reservoir with a capacity of 32,800 million cubic feet sprawling over an area of about 30 square miles. Its base is about 5½ miles long. A main canal, 124 miles long, taking off from the reservoir and aligned over a falling contour together with its 700 miles of distributaries, will bring water to a 2,07,000-acre strip of land nestling between the river Bhavani and the main canal. The strip of land that lies between the proposed canal and the rivers Bhavani and Cauvery on the north and north-east is about 70 miles long and four or five miles broad, except near the Cauvery on the east where it is nearly ten miles wide.

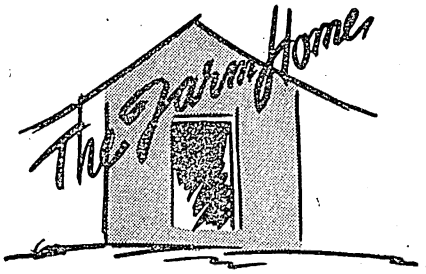
The Project was started in 1948 and completed in 1953. The main purpose of the Project is to supply irrigation water. Irrigation water is made available in the main canal from the 15th of September to the 31st of March every year.

RESTRICTED CROPS

The soils being very porous, cultivation of wetland crops like paddy and sugarcane would mean wastage of large quantities of water. Studies have shown that one cubic foot of water flowing per second throughout the growing period of the crop will be able to supply water for 40 acres of paddy or 150 acres of cotton or 165 acres of millets or oilseeds. As such, growing of paddy is prohibited in this tract so as to bring under irrigation a larger area. Since cotton requires more water than millets and oilseeds, the farmer is restricted from growing not more than half the area of his holdings with cotton.

Raising the green manure crop of sannhemp and incorporating the same *in situ* has not only increased the crop-yields by about ten to 15 per cent, but also improved the fertility of the soil. The use of fertilizers such as ammonium sulphate and superphosphate for cotton, millets and oilseeds is steadily increasing every year. It is expected that with the use of about 13,000 tons of ammonium sulphate and 9,000 tons of superphosphate, there will be an additional yield of about 15 per cent.

The Project is yet in the early stages of development. Prosperity is bound to come to the area when agriculture gets stabilized here. The start seems to have been well made.



AGRICULTURAL

looking for a hobby?

by
T.M. Paul

POULTRY-KEEPING has many advantages as a hobby and, what's more, you can expand it into a very sound business when you have acquired enough experience.

Firstly, it is one of the less costly hobbies, especially under village conditions. In villages, the birds can be fed on poor quality grains ; they can even be made to pick grains scattered about the threshing or winnowing yard. In fact, on the west coast, ducks are more or less wholly fed on scattered grain in the paddy fields, at least during the harvest season. In cities, kitchen and table wastes can be put to a good use.

Again, men and women of all ages can take to this hobby. Children are especially a great help. Once the grains have been purchased and a whole month's mash ration properly mixed by an elder, children can be fully entrusted with the birds' feeding care. Similarly, even an old or invalid person can look after the birds without much strain.

EASY TO HANDLE

Still another advantage is that the product of poultry-keeping, i.e., the eggs, can be easily collected, stored and marketed. Even if servants are employed to do these jobs, they can hardly tamper with the quality of the produce.

Then, it ensures an almost steady income throughout the year. This is of special significance to our farmers who can meet their casual needs for cash from this source. That would mean a less frequent recourse to the village money-lender.

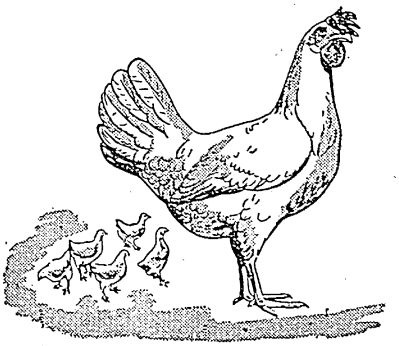
NO HAZARD

What a prospective poultry-keeper dreads most, however, is the thought of suddenly discovering that an infectious disease, particularly Ranikhet, has already invaded his flock. Such a hazard, however, can be eliminated to a great extent by getting the birds inoculated against the disease when they are eight weeks of age, and thereafter at yearly intervals. Free inoculations are arranged by the government.

Another objection is that the birds would run in and out of the house and soil the whole place. That would not happen if the birds are confined into a small wire-mesh enclosure at the back of the house. That done, there would be no fear of the birds ravaging the kitchen or flower garden. On the other hand, poultry droppings collected from the enclosure could be profitably applied to the plants. A creeper or two grown round the run would protect the birds against the sun.

BRIGHT FUTURE

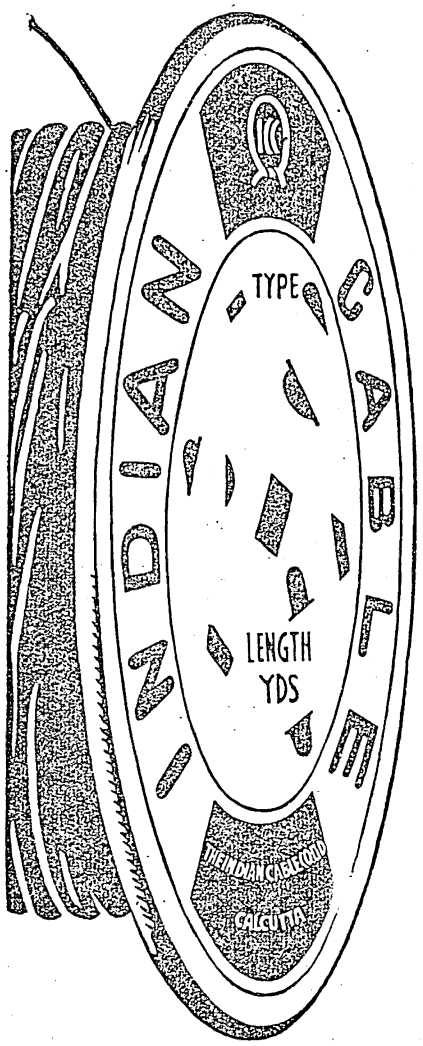
Above all, in view of the lack of enough milk to go round the population, extension of poultry-keeping could meet the problem of protein deficiency in Indian diets to a great extent. Though the orthodox among us might subscribe to the idea with a certain reservation, the younger generation has already accepted the egg as a valuable breakfast dish. As you know, from the egg to the chicken it is only a matter of 21 days. So, a bright future seems to be in store for the poultry industry in India.



FARMING ELSEWHERE

CONTD. FROM PAGE 26

production basis. Up to the present, the innovation of huge quantities of farm implements has raised the rate of production and ensured the achievement of increased output targets. This greatly increases the accumulation of capital and common savings of farm co-operatives which will be in a better position to buy bigger and heavier farm machines such as tractors, power engines and so on. The development of the farm implement innovation campaign has also placed huge tasks on local industry and handicrafts and spurred their development. The Hunan province alone built over 200,000 factories, mines and handicraft workshops during the first half of 1958. Most of them produce farm tools, thus further paving the way to rural mechanization and electrification.



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CASTOR
HAS CASH FOR YOU

by

Ajit Singh Dhesi
Deputy Director of Agriculture
Hansi

and

B. S. Gulati
Experimental Station
Hansi

CASTOR, the drought-hardy plant, is waiting to be introduced into the arid and sandy tracts of Rajasthan and the Punjab. Commonly known as *arind*, it is mainly grown in the states of Bombay, Madras, Madhya Pradesh, Bihar and Orissa. Of the 1,346,000 acres under the crop in India in 1953-54, Rajasthan and the Punjab accounted for a mere 2,000 acres.

At present, in the Punjab, castor finds a place along the well irrigation channels only. Even then it yields an income of at least Rs. 100 to 125 per acre. Besides bringing in this extra cash to the farmer, the plant, if grown on the field borders, serves as a very effective wind-break for chillies and protects winter vegetables from frost and cold. The castor plant, being tall and quick-growing, can also supply fuel to the farmer for three-four months, thus reducing the drain on cow-dung. The crop is fairly drought-resistant and can be grown in areas with an annual rainfall of ten to 15 inches.

Two varieties are commonly cultivated—the large-seeded perennial type and the small-seeded annual type. The oil obtained from the former is used for lubrication and in the preparation of Turkey red. It also finds a use in the manufacture of artificial leather, linoleums, etc., and transparent soaps. Oil from the small-seeded type is used for medicinal purposes.

Castor does best on sandy loam soils. It can also be grown on somewhat clayey soils, but a considerable admixture of sand would be necessary to make the soil well-drained. Three to four ploughings are sufficient for soil preparation.

Both the types are sown in July-August. Sowing can continue up to mid-September. The crop is ready for harvesting in March-April. The perennial type gives a fair crop for five to six years under favourable conditions, but the peak yields are obtained in the second and third years of sowing. The annual type gives about eight to ten maunds of seed per acre when sown alone.

Healthy and well-filled seeds should be selected for sowing. Soaking the seed for about 12 hours before sowing improves germination. The usual seed-rate is five to six seers per acre. The seed can be sown by *kera* behind the plough. Later on, the plants may be thinned out to five to six feet between rows and three to four feet in the row. In the annual type, the distance may be kept at three to four feet from row to row and 2½ to three feet from plant to plant. If a small area is to be sown, the seed may be dibbled.

The crop can be intercultured with the country plough crosswise in between the plants.

Harvesting of the crop may be started when all the fruits on the spike have matured. A large quantity of good quality seed will be harvested this way. Harvesting, however, should not be delayed unduly as mature capsules may shed.

CONTD. ON NEXT PAGE

Farmers I Have Met

a neat 600 rupees from a sugarcane acre



ANYBODY who happens to meet Shri Abdul Hameed Saheb of Nellikuppam in South Arcot district of Madras State would not fail to appreciate the way he raises sugarcane. A few years back, the sugar factory of the area awarded him a cash prize of Rs. 5,000 for his *Co. 419* crop which yielded 71.56 tons of sugar per acre ; he also got another prize for his March crop which gave 7.806 tons of sugar. I visited his farm recently.

Hameed gets his best yields of sugarcane from the fields in which sugarcane follows betelvine. "The betelvine is my most heavily-manured crop," he told me. "I cash in on the residual effect of the

manures that I apply to it by following it up with sugarcane."

The sugarcane is also given a fairly heavy dose of fertilizers, which in turn benefits the ratoon crop. Then come paddy-green manure-paddy, which take two years and help the land recuperate.

Hameed's way of growing sugarcane is very much different from that followed by other farmers of the locality.

After removing the betelvine in January, sugarcane is put in the trenches in double rows. The rows are a foot apart. This saves the preparatory cultivation. Two hundred pounds of superphosphate per acre are also applied ; the ratoon crop gets an additional 50 pounds of it.

If no rain is received, fortnightly irrigation is given.

The 40th day, all weeds are removed, ridges containing the residual cattle manure applied to the betelvine broken up and trenches between the two rows of sugarcane filled up. Mixed fertilizer at four bags per acre is applied simultaneously. The dose is repeated after 15 days.

The crop is manured a third time, in the fourth month, with two bags of mixed fertilizer and two bags of ammonium sulphate per acre.

In July, trenches about 1½ feet deep are dug between the two rows of sugarcane. The dug-out earth is heaped in such a way that the original trenches get earthed between the rows as well as on the sides of the rows. Another four bags per acre of mixed fertilizer are given at the same time.

And, Hameed has no complaints about the amount of labour or cost involved. After accounting for everything he nets in a neat profit of 600 rupees from an acre !

—M. J. D.

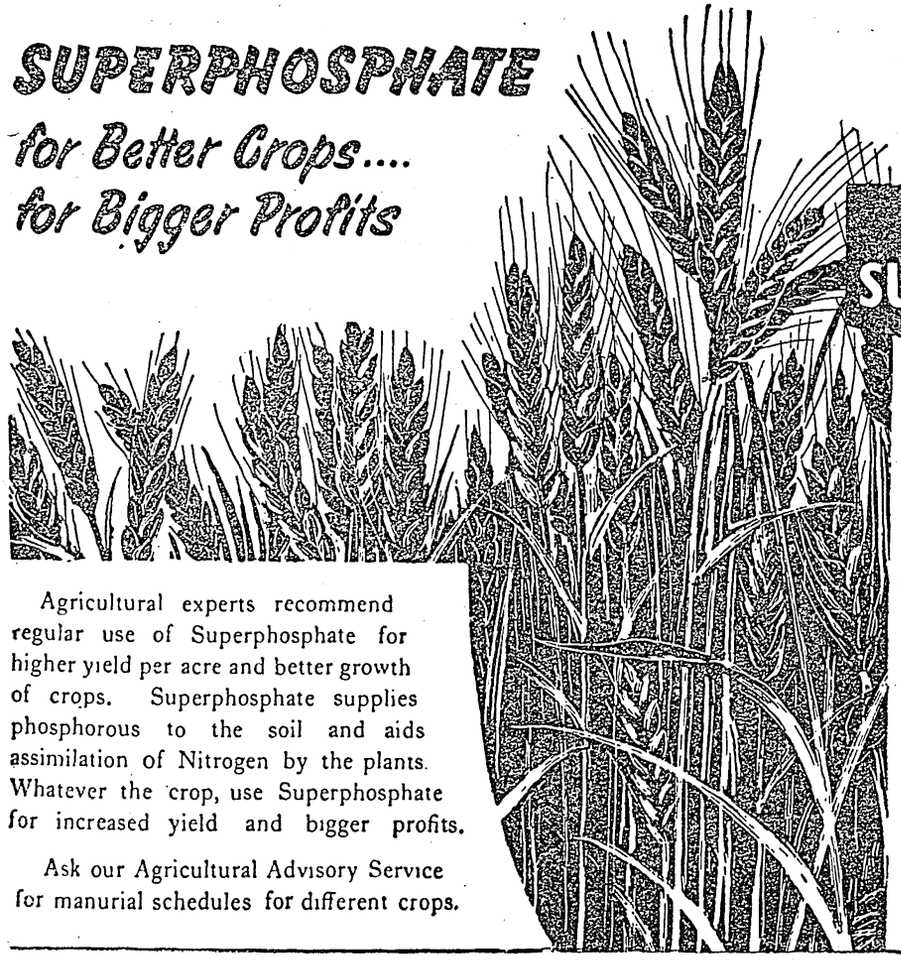
CASTOR

CONTD. FROM PREVIOUS PAGE

The capsules after collection should be dried in the sun for a few days and then the seeds taken out by beating with sticks.

Experiments have shown that the quality or the quantity of the oil in the castor seeds is not in any way affected even when the seed is stored for three years. The seed may either be stored in bags or baskets, or even open as is usually done by farmers. Farmers can take advantage of the long keeping quality of the seed. They can wait and sell their produce when the prices are attractive.

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AGRICULTURAL LIBRARY

How They Are Improving Grasslands in Saurashtra

by
F. W. Albertson

A PROGRAMME of grassland improvement started under the auspices of the Kansas State College-T.C.M.-India Team has been well under way near Rajkot in Saurashtra.

In many locations in Saurashtra, grasslands extend almost continuously for many miles. In other sections, however, they usually occupy only the rough rocky locations where cultivation is impossible. It is estimated that in Saurashtra there are at least three million acres. Unfortunately, nearly all of this vast acreage is in a badly deteriorated condition. In the heavily grazed areas, most of the good grasses have disappeared and in their places is an open stand of unpalatable, low-yielding annual species such as *Aristida funiculata* and *Gracilea royleana*. In the rough areas, nearly all the soil has been washed away by severe sheet erosion, leaving nothing but disintegrated rocks on the surface. Areas reserved from grazing during the monsoon are scattered widely throughout the grasslands. These better grasslands are cut for hay after the monsoon and then grazed until the beginning of the next period of rainfall.

In the improvement programme, small areas of heavily grazed grasslands were to be placed under improvement and used to observe and demonstrate how this type of enterprise may best be organized and administered. Selections were made of relatively small areas of both reserved and heavily grazed grasslands that were located in various parts of Saurashtra where they might be readily accessible for demonstration purposes. Arrangements were made to administer the programme through the Soil Conservation Service because it has an organization working at the village level and so careful supervision is possible.

The technique of grassland improvement involves some form of complete or partial protection from grazing to allow time for the progressive forces of Nature to heal the wounds resulting from past years of abuse.

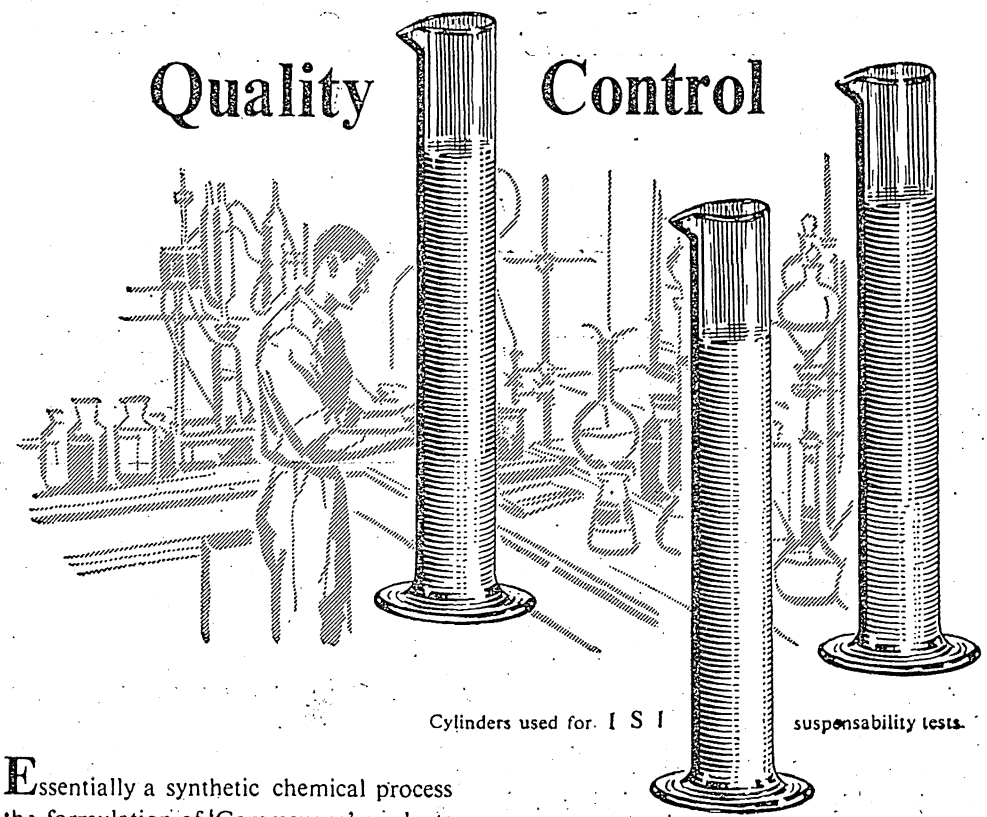
The general three-area regulated plan for improving poor grasslands is given below.

Area A	*Area B*	*Area C*
1957-58. Ungrazed. Contour furrows and plant grass seeds or sods if topography and condition of grasslands require such.	*1957-58.* Grazed.	*1957-58* and *1959-60.* Ungrazed.
1959-60. Ungrazed (June to October). Cut for hay if growth is good. No winter grazing.	*1959-60.* Ungrazed. Contour furrows and plant sods or seeds as found best in A.	
1961-62. Graze lightly. Leave one-half of growth on ground to improve soil, check erosion and increase water infiltration.	*1961-62.* Cut for hay if growth is good.	*1961-62.* Ungrazed. Contour furrows and plant sods or seeds as found best in A.

1. During 1957-58, defer from grazing area A.
2. During 1957-58, graze continuously areas B and C, but the stocking rate should be reduced 1/3, so that the grazed portion would not be utilized heavier than usual.
3. During 1959-60, defer area B, cut for hay from area A and graze continuously area C.
4. During 1961-62, graze lightly area A, cut for hay from area B and defer C as A was in 1.
5. Variations in procedure have to be made in accordance with the results obtained and with changes in local conditions.

With the areas selected and protected from grazing, it became necessary to determine what supplementary measures should be undertaken to encourage a rapid recovery. Because much of the nearly barren grasslands

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are on steep topography where runoff and erosion were excessive, it seemed necessary to adopt some method of controlling the ever-increasing loss of water and soil. Contour furrows, therefore, were made at one foot vertical intervals. These furrows should collect water during rains, and they should also provide a location for planting sods or seeds of desirable grasses.

A total of 20 demonstration plots was selected. These areas were concentrated most heavily near Rajkot with a few scattered quite widely in grassland areas of Saurashtra. Most careful supervision was given to those areas situated near Rajkot. Each of the six demonstration grasslands located in different directions from Rajkot was visited often and records were kept regarding the effect of protection from grazing on both the dominant perennial plant species and annual plant invaders.

EDUCATIONAL PROGRAMME

Before selecting the demonstration projects, many visits were made to villages where the value of such a programme was explained to the Sarpanch and other village leaders. Contacts were also made with certain Government officials in order to be certain that the areas selected for demonstration projects could be maintained as such for at least the two-year period.

Data collected on various reserved and heavily grazed areas were processed and put in proper form to be used as a part of the educational programme. For example, data on yields of vegetation on reserved grasslands in comparison to that of heavily grazed areas were used to show the tremendous loss that occurs when areas are continuously overutilized. Enlargements of photographs of good and poor grasslands as well as actual samples of good and poor grasses were also used.

The material has been arranged in display panels that can be easily transported by jeep to villages, exhibits at fairs or other places where information of this kind would be of value.

FIELD STUDIES

In order to make accurate comparisons between good and poor grasslands, it was first necessary to collect facts of various types regarding these grassland areas.

Fortunately, much information was already available on many grasslands in India. Considerable work had been done in Saurashtra on the taxonomy of grassland plants, but less was known concerning the effect of intensity of utilization upon yield, density and species composition of grassland vegetation.

It was felt, therefore, that considerable effort should be made to collect data on certain of the reserved and heavily grazed areas so that comparisons could be more accurately made. This information will be very important in making decisions with regard to conducting the grassland improvement programme as it is expanded during the future years. These facts were also used to advantage in connection with the educational programme.

One of the first questions concerning the grassland programme is "What will it do to the amount of vegetation produced ?" Also, "Can we get back some of the good grasses if we remove grazing for two years?"

To make it possible to give a correct answer it was decided to make studies on yield and species composition in reserved and heavily grazed grasslands.

Clippings of grasses were made in three reserved and three heavily utilized areas, and the following average yields in pounds per acre of air-dry grass were recorded in 1957.

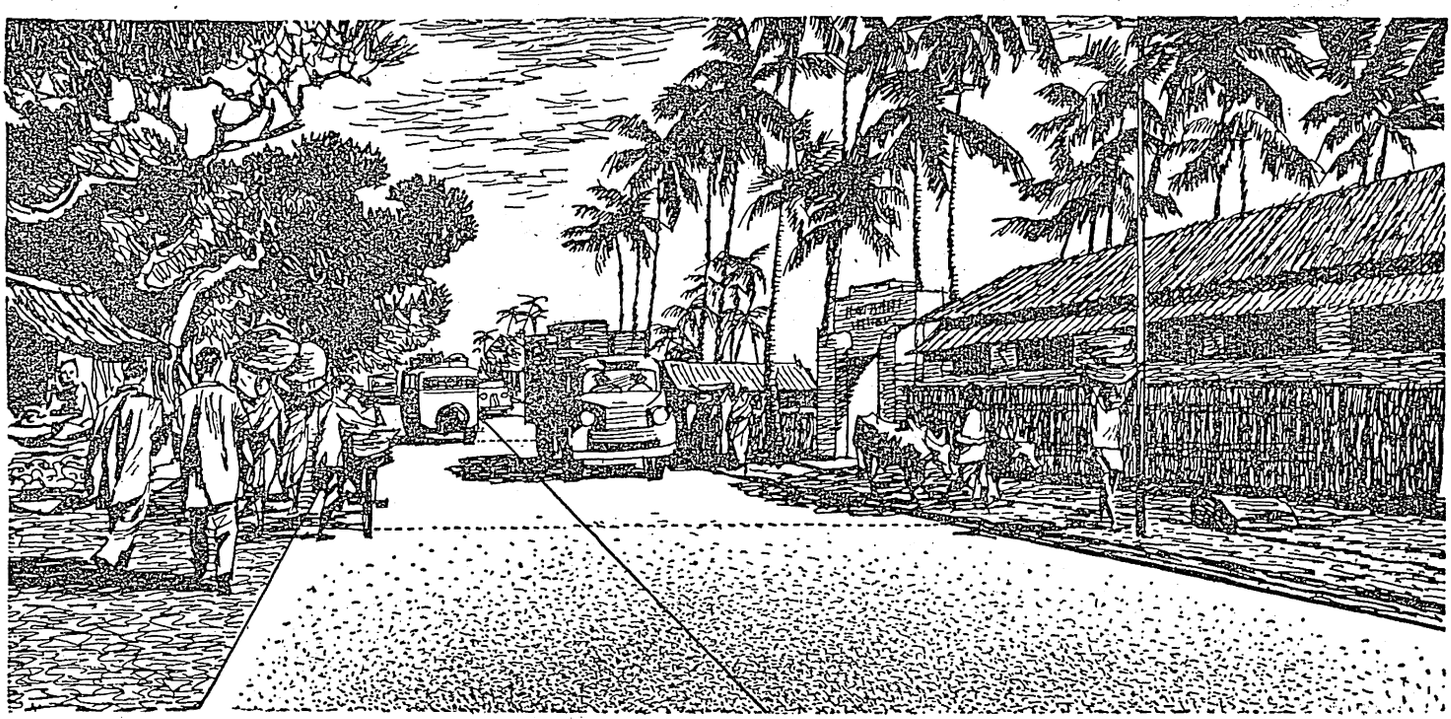
Reserved grasslands Valadhari Hirasar Paneli			*Heavily grazed grasslands Valadhari Hirasar Paneli (Kolithad)*		
3,897	1,914	1,868	569	591	286

At Valadhari, the maximum yield was found to be nearly 3,900 pounds on a grassland that is reserved from grazing during the monsoon, but in autumn, after harvesting the grass crop with sickles, the area is grazed by livestock during winter and summer until the next monsoon. The growth of perennial grasses during the monsoon of 1957 was quite vigorous, but there is nearly a solid cover of fairly palatable annual grasses forming a lower storey to the taller perennial species such as *Sehima nervosum* and *Chrysopogon montanus*.

In a village grassland near Valadhari, the yield was only 569 pounds of air-dry forage mostly of annual, unpalatable species such as *Aristida funiculata*. The difference in yield in these two grasslands is mostly due to differences in systems of management. In the reserved area, the vegetation was allowed to grow during the monsoon after which the grass was harvested and then grazed by livestock. The heavily grazed area, however, was utilized throughout the year. Comparative yields are indeed striking but the quantity of forage produced is not the only difference between the two areas. Observations made in many heavily grazed grasslands indicated that annual, low-yielding species, most abundant of which is *Aristida funiculata*, were actually eaten by livestock only when nothing more palatable was available.

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The average percentage composition of perennial and annual grasses on reserved and heavily grazed grasslands was as follows.

Condition	Type of grass	Location			Average
		Valadhari	Hirasar	Paneli	
Reserved	Perennial	49.2	40.5	51.6	47.1
	Annual	50.8	59.5	48.4	52.9
Heavily grazed	Perennial	13.0	11.0	17.0	13.7
	Annual	87.0	89.0	83.0	86.3

It will be seen that the perennial grasses comprised nearly 50 per cent of the total vegetation on the reserved areas, but averaged only 13.7 per cent on those heavily grazed.

The average per cent basal cover of vegetation on the same three locations was as given below.

Kind of grassland	Per cent basal cover			Average
	Valadhari	Hirasar	Paneli	
Reserved	19.3	13.3	17.6	16.6
Heavily grazed	9.0 (Kolithad)	8.7	6.9	8.2

RECOVERY EXPECTED

Much interest has been shown in the amount of recovery that might be expected if areas, heavily utilized for many years past, were protected from grazing for a period of several years.

Fortunately, considerable information on this point of interest was readily available at a nearby village. Through the efforts of the Department of Agriculture of Saurashtra, a ten-acre plot of heavily grazed grassland near Dhrol was excluded from use by livestock in August, 1954. Trenches were dug and bunds constructed in different locations in the protected area. Sods of *Dichanthium annulatum* were also planted along the furrows made by the bullock plough.

Digging trenches, constructing bunds and planting sods were, without doubt, important in bringing about a more rapid recovery, but the changes that occurred in this area during the two years since 1954 were quite largely those brought about by the natural processes of the secondary succession that occur everywhere when the deteriorating influences of overuse are removed.

A small, heavily grazed grassland adjacent to the one reserved since 1954 was excluded from use by livestock in June, 1957, and plans were formulated to make certain comparisons between the two areas in order to know that recovery had occurred in the reserved area during the past two years. The following data were collected.

Factor	Kind of grass	Condition of grassland	
		Reserved	Heavily grazed
Per cent basal cover	Perennial	10.0	1.7
	Annual	18.3	8.6
	Total	28.3	10.3
Per cent composition	Perennial	35.3	14.7
	Annual	64.7	86.3
	Total	100.0	100.0
Total yield in pounds per acre		1,864	491

It is seen that the basal cover in the reserved area was 28.3 per cent as compared to 10.3 per cent in the one heavily grazed. Perennial grasses comprised 35.3 per cent of the composition of the vegetation in the reserved area and only 14.7 per cent in the overgrazed location. The yield of vegetation in the two areas was also greatly different, being 1,864 pounds per acre in the reserved and only 491 in the other. These differences have occurred in two years of protection from grazing.

NUTRITIVE VALUE

Grassland vegetation is important as a livestock food primarily because of its nutritional value. In several locations, where clippings were made to obtain yields, the vegetation was analysed to determine various chemical constituents that are important to the maintenance and growth of livestock.

In one series of areas, clippings were made on the same locations early in each month from August to November inclusive. In three other series, the first clippings were delayed until early September, early October and early November, respectively. In this arrangement, it was possible to obtain samples of grass that had grown for only one month beginning in early August and ending in early November. Also, the first clippings were made where vegetation had grown from the beginning of the season to early September, early October and early November.

Thus it was possible to know the effect of the stage of growth of the vegetation, from August to November, on the percentage composition of the various constituents.

Crude protein was, perhaps, the most important constituent for which determinations were made. It was found that the protein content of the vegetation

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NEW DELHI—2

harvested on August 7 from a reserved grassland was between 4.79 and 6.97 per cent. If the same areas were reclipped early in September, October and November, the protein content of the tender growth decreased less than one per cent. However, if the first clippings were made in early September, October and November, the percentage of protein was approximately 3.80, 2.40 and 1.75, respectively, for the three months.

The data indicate how important it is to utilize the vegetation before it has become coarse and less palatable. If grasslands are utilized in early growth, it should be realized that, in order to maintain them, they must be given time for regrowth to restore vigour in the plant and to produce seed for replacement of old plants.

On the heavily grazed areas where growth began later than on the reserved grasslands, the vegetation was in its early stages of growth when harvested early in August. Also in these locations was a fairly dense stand of low-growing, broad-leaved plants, mostly annual legumes. The protein content of this weedy vegetation was between ten and 12 per cent in early August and from 5.5 to 6.0 per cent when harvested in early September. No data were obtained on these areas where the vegetation was mature. The high protein content of the early growth explains why livestock do well early in the season when sufficient forage is available.

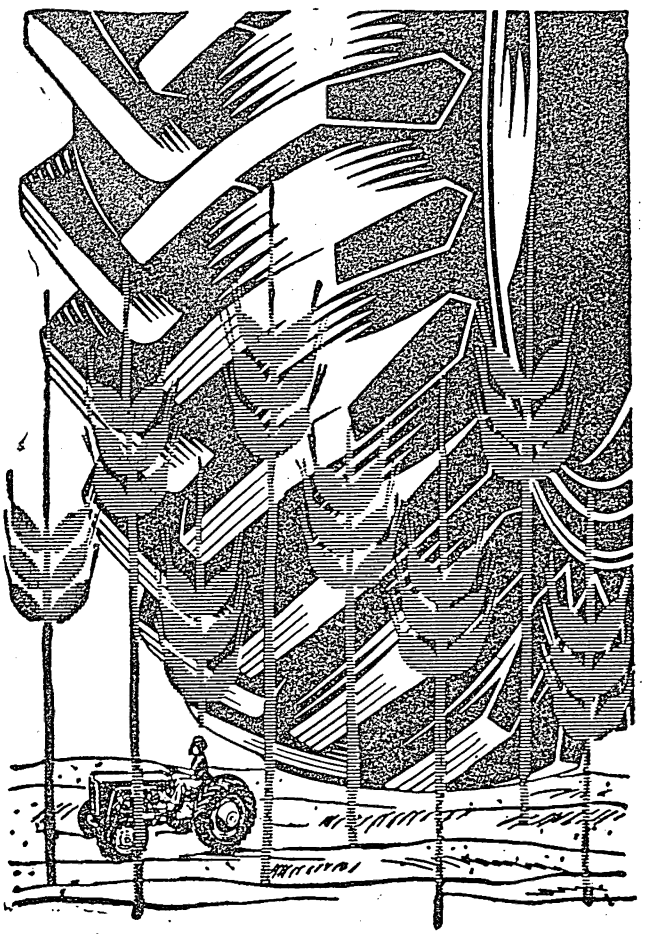
POST-REHABILITATION MANAGEMENT

After two, and possibly four, years when some areas have been rehabilitated, it will be highly desirable to initiate a programme of management that will leave on the ground at least 40 per cent of each year's growth to maintain vigour in the plants and protect the soil from runoff and erosion. Good management is an essential part of maintaining good grasslands.

Good management may be accomplished by conservative year-long utilization, or, as recommended by some grassland technicians, the areas utilized may be divided into several parts and each division grazed in rotation. Here is a plan for grazing where grassland is divided into four areas and is grazed in rotation.

Area A	*Area B*	*Area C*	*Area D*
Begin grazing July 15 and continue until grass is reduced to a predetermined height—perhaps four inches Then remove livestock to area B	Graze as in area A, then remove livestock to area C	Then to area D	When area D is grazed to the desired height, livestock are returned to area A to begin over again

The second year of the grazing should start on an area having the longest period of growth from the previous season

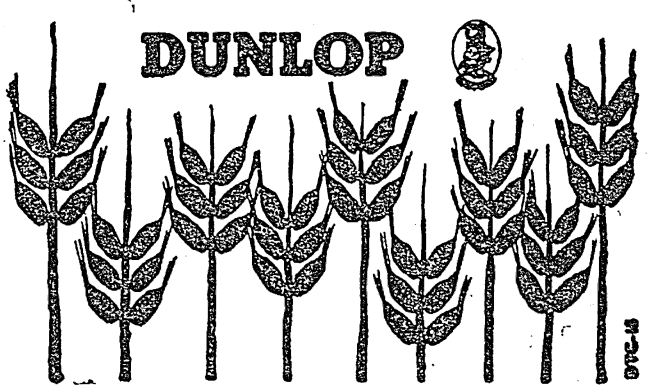


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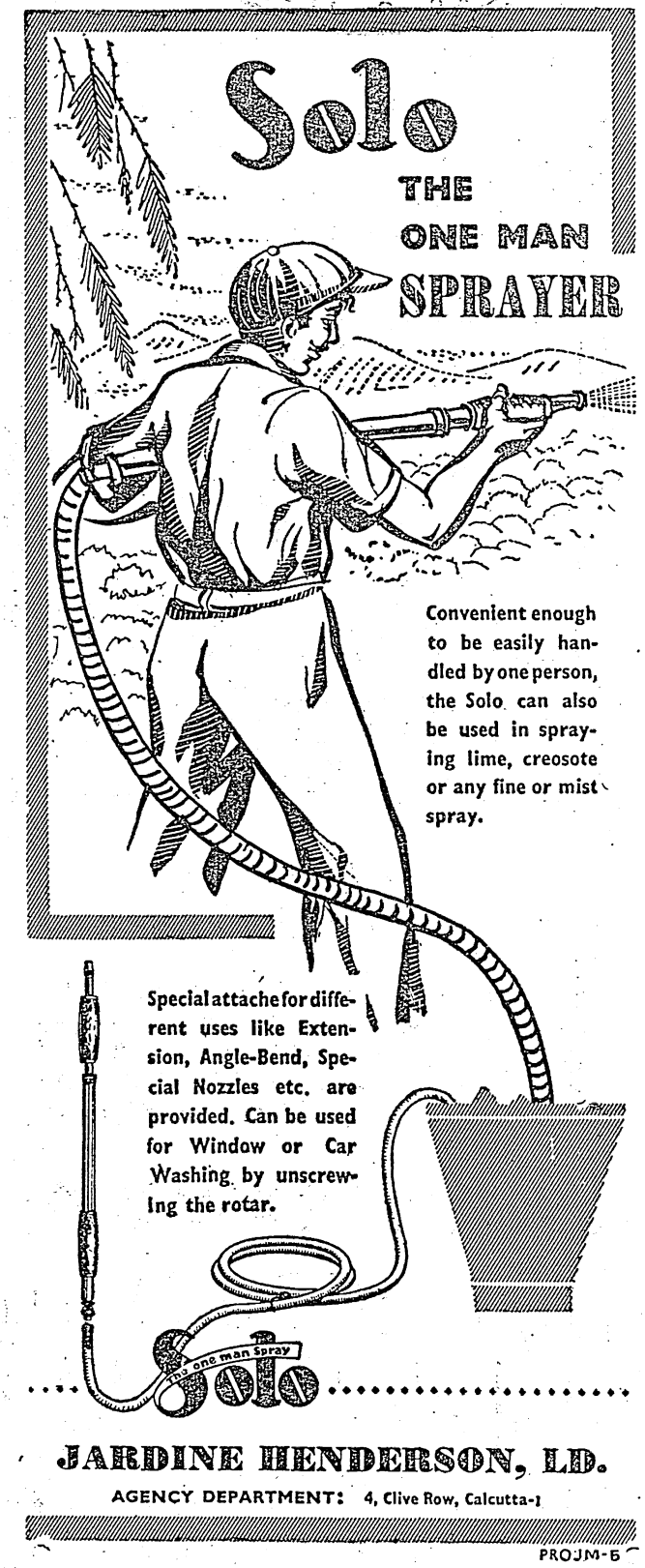
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The number of divisions would depend upon the circumstances such as the size and topography of the total area, the number of livestock, availability of water, etc. The number of the livestock used in any rotational scheme should be such that a satisfactory regrowth occurs between periods of grazing. The value of rotational grazing is largely due to the fact that livestock are compelled to utilize with approximate equal intensity the poor as well the good plants. This type of use is in contrast to "spot grazing" so common where the stocking rate is light but continuous. A management of this kind often results in a close grazing of the palatable species and making little use of the plants not relished by livestock. Either plan can be operated successfully.

However, no plan of utilization will be satisfactory unless it is applied with good judgment. A change in the stocking rate and the period of use should readily be made if the results achieved are not satisfactory. The greatest danger in any grazing scheme is overuse. The only answer to overutilization is a better distribution, and perhaps as is usually the case, a reduction in the number of livestock.

SYMPOSIUM

ON

"SCIENTIFIC CONSERVATION OF MATERIALS"

A symposium on "Scientific Conservation of Materials" will be held at Kanpur in January, 1959, under the auspices of the Scientific Workers' Association (Ministry of Defence).

The symposium which is proposed to be held immediately after the Delhi session of the Indian Science Congress will focus attention on the importance of conservation and the various ways by which this can be effected in different fields, including food and agriculture.

Further particulars from the Scientific Workers' Association (Ministry of Defence), P.O. Box No. 173, 18/56, The Mall, Kanpur.

TATA-FISON will be coming round the mountain – when they come!

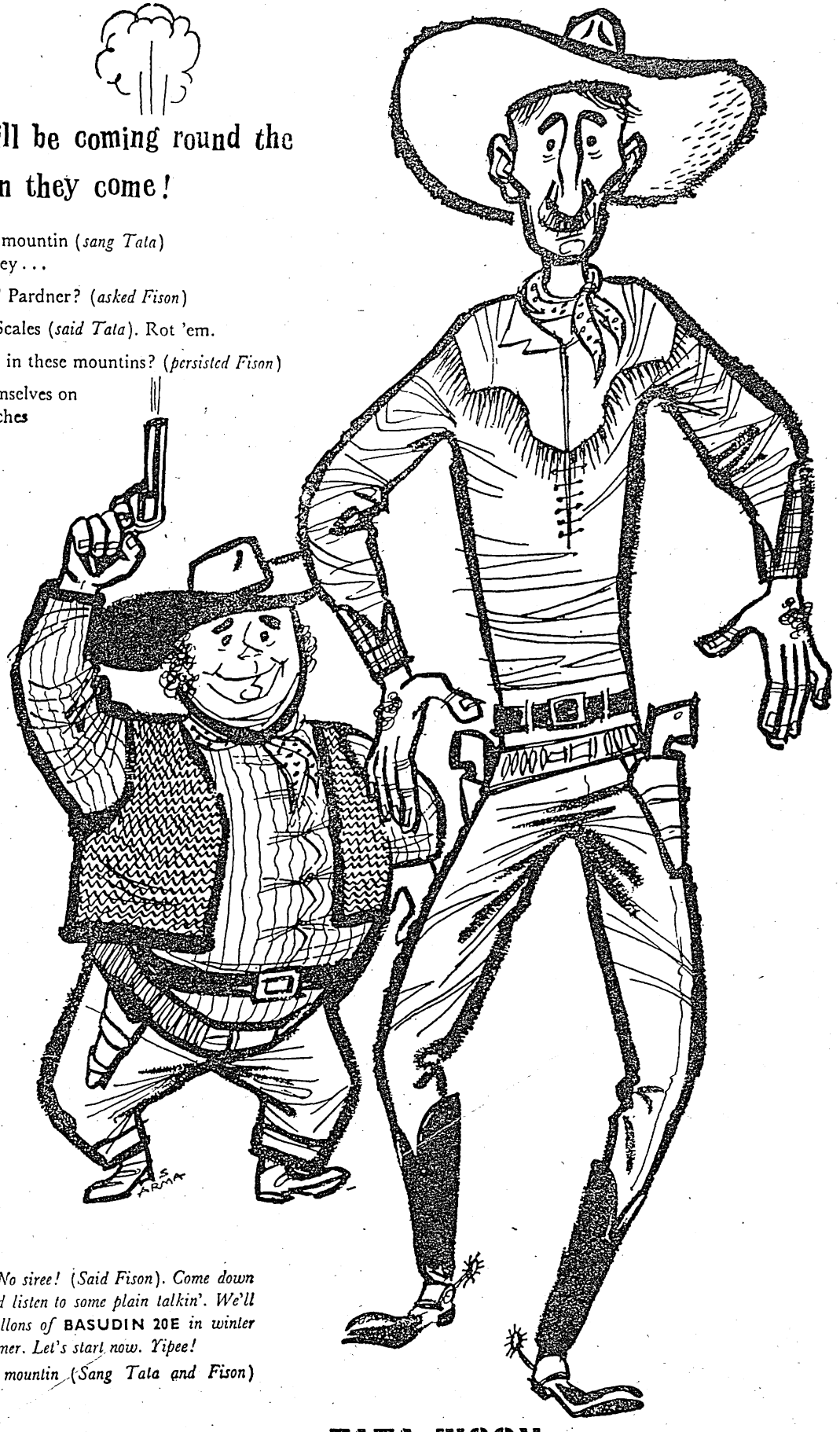
We'll be comin' roun' the mountin (*sang Tata*)
when they come, when they . . .

Yipee! Say, who's comin' Pardner? (*asked Fison*)

Them doggone San Jose Scales (*said Tata*). Rot 'em.

What's them critters doin' in these mountins? (*persisted Fison*)

Makin' perfect pests of 'emselves on
them thar apples an' peaches
an' pears (*said Tata*)



Not with this pair around! No siree! (*Said Fison*). *Come down from yore mountin Pard, and listen to some plain talkin'. We'll spray each tree with 2-3 gallons of* **BASUDIN 20E** *in winter and with 3-4 gallons in summer. Let's start now. Yipee!*

We'll be comin' roun' the mountin (*Sang Tata and Fison*) *when they come . . .*

As the San Jose Scale said to the Woolly Aphids . . . **TATA-FISON** *will be the death of us!*

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Who wants more food ?

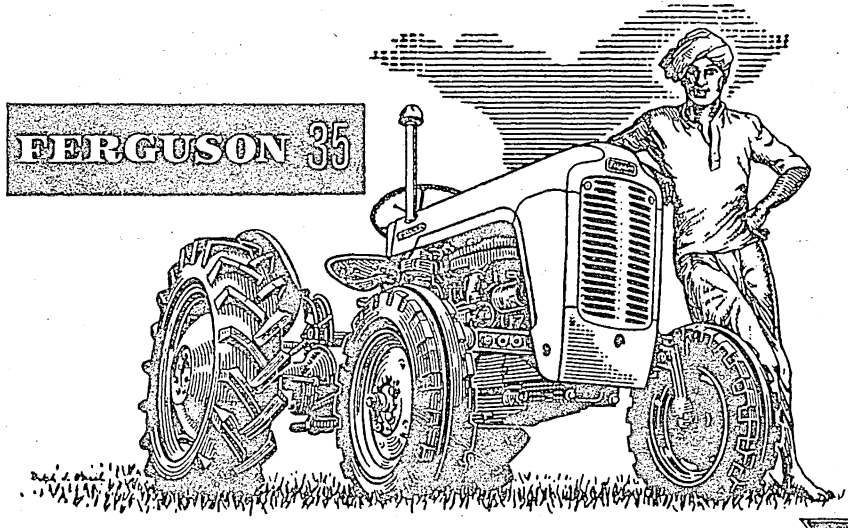
My basic job is to assist in raising this country's food production from its present low level—so low that we have to buy abroad.

The extent to which I can help is very often not realised—it certainly is not realised enough.

Whether it is wheat or rice—gram or grass—sugar or groundnuts—whatever it is, only I can reliably and economically :

- Have the soil ready for the rains or water,
- Prepare the best tilth to suit the crop,
- Sow quickly and well on the right day,
- Give the crop attention whilst it grows,
- Harvest at the right time,
- Do, in time, all those never-ending duties such as agricultural haulage, soil conservation, water distribution and so on—which mean the difference between shortage and enough.

MECHANISATION MEANS MORE MEALS

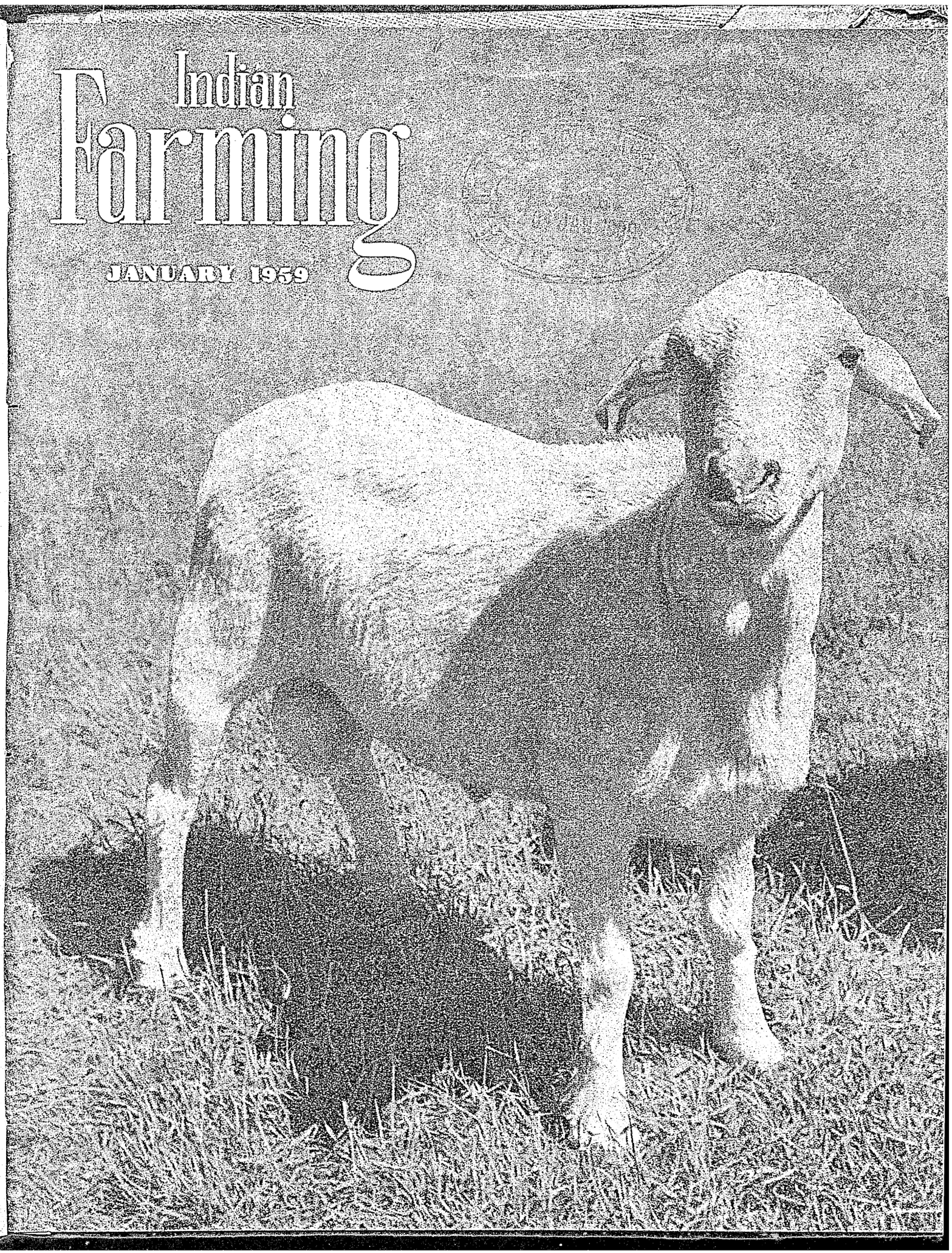


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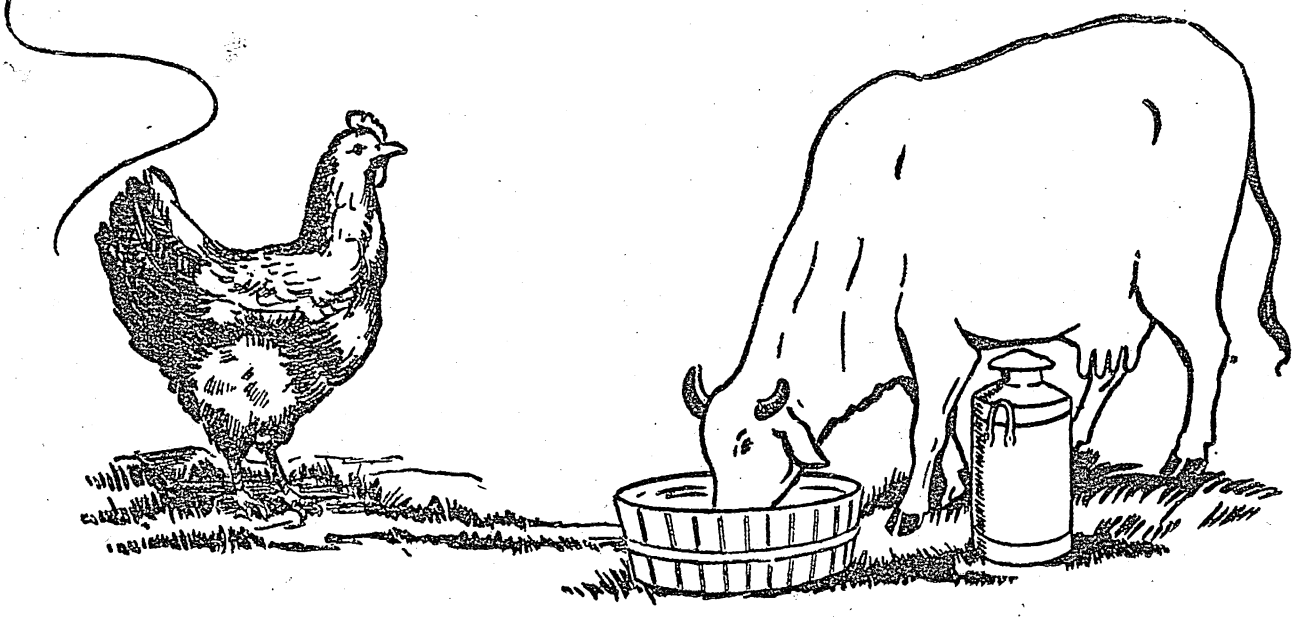
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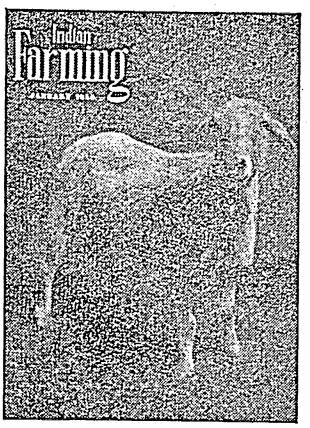
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Vol. VIII No. 10

OUR COVER



Looking straight into your eyes here is a typical Bannur ram. This small-sized Mandya sheep of Mysore stands out as an excellent meat-yielding type. No clip, but useful in a mixed farming plan

Photo by H.K. Gorkha

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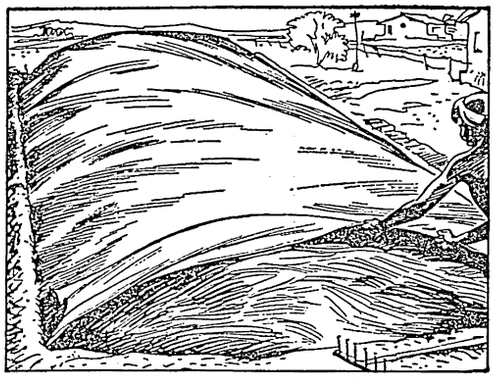
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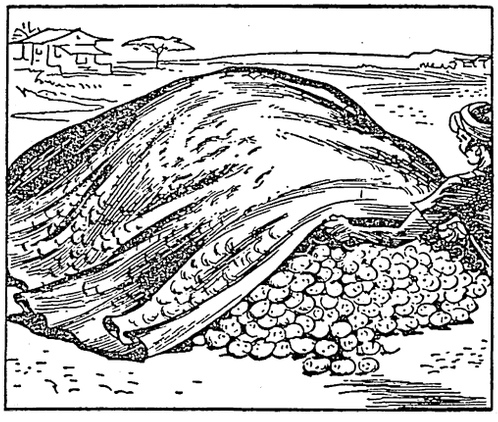
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editor's page

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THE RAT PROBLEM

THE many ways in which the rat deprives the nation of huge quantities of food makes it our worst enemy; the speed with which it multiplies makes its control real difficult.

The rat begins its despoiling task right when the seed is sown in the field. It eats away the germinating seed, does not spare the growing crop, picks out ripening grain from the ears and is ever-present in the godown where the grain is stored. The pity of it is that it wastes more than what it eats, and also carries and spreads diseases.

A single pair of rats unchecked can become a family of 250 within a year. The present rat population of the country is estimated at 2,400 million. The quantity of food consumed or wasted by rats, therefore, runs into a sizable figure. Many more mouths could be fed even with our present food resources only if farmers *acted* against this Nuisance No. 1.

The need of the day, therefore, is rat control measures in the farm home, in the field and in the store. In fact, rat control forms an important part of the current *rabi* campaign for increased production from food crops. Rats are being killed by catching them in traps, by fumigating their burrows and by the use of poison-baits.

But what would make these measures really effective is a genuine desire on the part of every farmer to exterminate the menace. The objective can be achieved only by a concerted action and not isolated efforts. The rat must be declared a national enemy, and a war on it proclaimed.

It would be interesting to know that a mass-scale action against rats in 1954 gave farmers of six districts of the former Hyderabad State an additional 300 tons of foodgrains. In all about 11,000 acres were covered. In terms of money, the saving amounted to Rs. 90,000 !

YOUR QUESTIONS

and

SUGGESTIONS

are

WELCOME

Address these to
The Editor, "Indian Farming," I.C.A.R.,
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Truck Farmer Thinks a Lot of Vegetables



A cauliflower to be proud of

by
Harkirat Singh

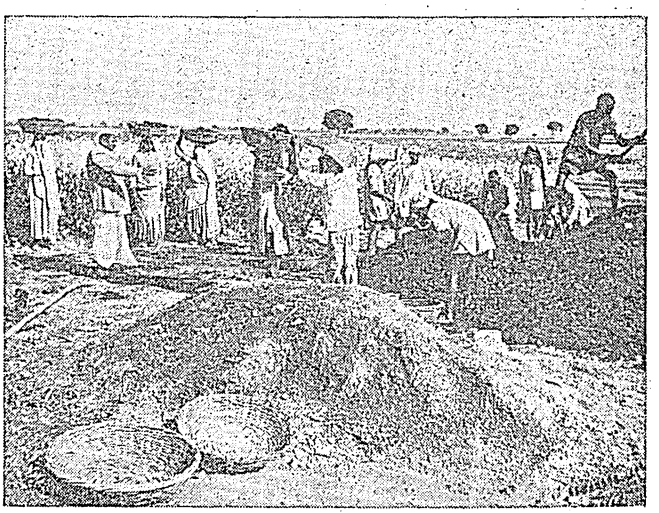
IN the immediate neighbourhood of the municipal dump in Ghaziabad in Uttar Pradesh is a vegetable farm which is quite prosperous. It is the work of two generations. The father, Shri Budha Singh Saini—after whom it is named—gave it a shape out of an uneven thick jungle waste; the son, Shri Din Dayal, today manages it and has brought to it all the improved methods.

"Many people do not take to vegetable cultivation because of the hard labour required for it," Din Dayal started off a conversation with me, when I visited his farm last month. "But my father saw good income in it and so took this land on lease from the Government some fifty years ago. Since then, our family has specialized in growing vegetables," he said.

NICE FIELDS

Nicely laid out, spick and span vegetable fields are pleasing to the eye: the Saini Farm has seventy acres of them. Vigorous crops of radishes, turnips, cauliflowers, cabbages, tomatoes and brinjals were very much in evidence, and young crops of peas and potatoes were coming up quite nicely. Din Dayal plucked a few

Manure by the truckload



ripe, red tomatoes for me and I found they were luscious to taste, too.

SUCCESS FORMULA

A wise blending of the old and the new—the skill acquired by the family over a long period and the scientific recommendations made by the agriculture department—is the "success formula" of Din Dayal. Whatever he does, he put it briefly for me like this:

A thorough ploughing of the land; at least four times with tractor and four times with the *desi* plough.

Adequate manuring, a minimum of 15 truckloads of farmyard manure per acre, besides the recommended doses of ammonium sulphate, superphosphate, if available, and also groundnut and castor cakes. "I am the largest single buyer of municipal compost in Ghaziabad, and sometimes I buy it from as far as Delhi also," he added.

Nothing but improved seed. He grows: *Snowball* and *Purple Top* turnips; *Bonny Best* and *Marglobe* tomatoes; *Early Patna*, *Snowball*, *China Pearl* and *Katki* cauliflowers; *Drumhead* cabbage; *Marrow Fat* and *Simla Cap* peas. "I purchase all my seeds at the Government Seeds Store. For three years thereafter I save my own seed, and then again put in fresh seed," he informed me.

Frequent shallow cultivations to destroy weeds and provide a soil mulch. Timely irrigation—he has three tubewells. Protection of crops from pests and diseases.

SMALL STUDY

He led me to his study: yes, he has a small study where he keeps whatever information material on vegetable-growing he is able to gather, some agricultural magazines, seeds catalogues and plant protection literature from commercial firms; also, a number of photographs taken on his farm showing outstanding crops and recording visits of important visitors. "The commercial insecticides I use only after consulting the plant protection officers of my area," he told me.

The business man in Din Dayal came out when he revealed that he personally was not in favour of very big fruits. "I prefer varieties which give me neither too big nor too small a size," he began explaining, "and there is a reason for this: the requirement of the ordinary customer who wants to buy in small quantities. Of course, the quality *has* to be good," he added.

Who would not believe that the produce of the Saini Farm is in demand even in the Delhi market, that it sells at a premium and that Din Dayal is finding vegetable farming much more paying than any other type of farming?

Seen here in full bloom is a radish seed crop



An apt reward for hard labour—ample fine produce



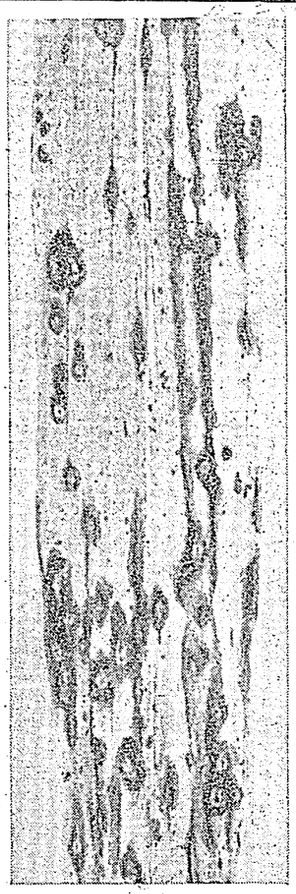
Red Spots That Rob You of Jowar Fodder

by

Kishan Singh Bedi
Plant Pathologist, Punjab

and

Jaswant Singh Chohan
Assistant Plant Pathologist
Government Agricultural College
Ludhiana



Typical spots on a *jowar* leaf. Note the small, black dots in the centre

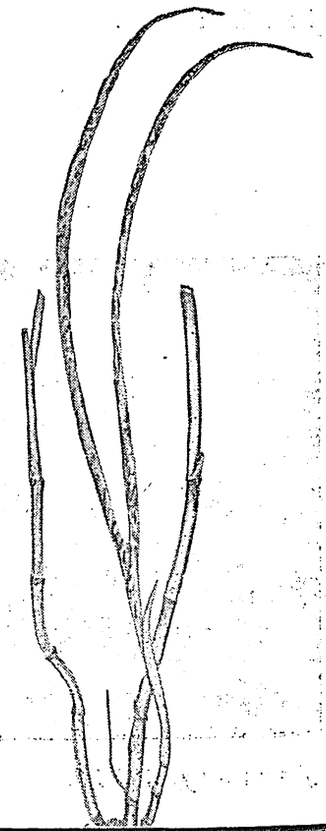
COMPARATIVELY less harsh on the grain yield, the leaf-spot disease causes a serious reduction in the yield of fodder from the *jowar* crop.

Sorghum or *jowar* (*Sorghum vulgare* Pers.) is the premier *kharif* fodder crop of the Punjab and a prominent grain crop of the south-eastern rain-fed tracts of the State. The disease is locally known as *jowar ke patton par lal dagon ki bimari*. The red spots on the leaves are caused by at least six different fungi and one bacterium. Amongst these, the red leaf-spot disease due to the fungus *Colletotrichum graminicolum* (Ces.) Wils. and known as Anthracnose is extremely serious, particularly in humid places of the State, like Gurdaspur, Hoshiarpur, Ambala and Karnal districts.

The disease first appears on the leaves in the form of very small, circular or oval spots which enlarge during the monsoon season under favourable weather conditions, i.e., a suitable temperature, high humidity and abundant rainfall. They often coalesce and kill most of the leaf-area. The leaves affected in this way become dry, are soon cast and the stalks denuded. The red spots also appear on the midrib of the leaves and on the leaf-sheaths, where they are more long than broad.

In the centre of the majority of the spots and over the dead straw-coloured areas of the leaf, very small black dots appear in groups. These are the fruiting bodies of the fungus. They contain in them spores or microscopic reproductive structures of the fungus, along with long and black bristle-like structures.

The spores contained in these fruiting bodies are spread widely during the rainy weather accompanied by wind. After settling on the leaves, these spores



Stalks and diseased leaves of *baru*

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The causal fungus : *a.* and *b.* bristle-like black structures along with boat and sickle-shaped spores, *c.* germinating spores with germ-tubes, *d.* a fruiting body, and *e.* the thick-walled spores

germinate under the influence of moisture in the form of free water and suitable temperature (25° to 35°C) by producing one or more germ-tubes with knob-like bodies, with which they attach themselves to the leaf-surface before penetrating and causing infection. Thick-walled resting spores (chlamydospores) are also produced by the fungus in great abundance. If the weather conditions are favourable for the development and spread of the disease, field after field is engulfed by it and suffers great damage.

The ears also get infected as soon as they emerge from the upper leaf-whorl of the *jowar* plant. The glumes and the seed-stalks also contract infection in the form of very small, circular to elongate, deep-red spots, with small, black, fruiting bodies of the fungus in them. If the infection is severe, not only is the seed-setting in the ears reduced, but also the grains that are formed are not filled properly and shrivel, resulting in poor-quality produce.

The red spots, and even the black fruiting bodies, appear on the grains under severe infection, particularly when the rainy season becomes prolonged till the end of September.

Countless spots covering the new winter growth of a stubble plant of *jowar*



OTHER LEAF-SPOTS

Given below are the characteristic points which distinguish the other leaf-spots of *jowar* from Anthracnose.

Grey leaf-spot caused by *Cercospora sorghi* Ell. and Ev. The spots produced by the disease are rectangular and blood-red in colour, with grey centres. They extend in between the leaf-veins and attain a length of one to three centimetres.

Ramulispora leaf-spot caused by *Ramulispora sorghi* (Ell. and Ev.) Olive and Leferbvre. The spots, which are bordered by a deep-red margin, are elliptical, several centimetres long, about 0.5 centimetre to 1.5 centimetres in width and regular in outline. Numerous small, rough, nearly circular, black bodies, the sclerotia of the fungus, are produced within the tissues of the spots and are also partly visible on the surface.

Phyllosticta leaf-spot caused by *Phyllosticta sorghi* Sacc. The spots produced by the disease are usually oval, with yellow areas bordered by an irregular and light-red margin. They sometimes attain a length of several centimetres. In the centre of the spots, many pycnidia develop in rows. The pycnidia are formed below the epidermis and open through an aperture, releasing numerous spores in mucilaginous masses in the form of long tendrils.

Zonate leaf-spot caused by *Gloeocercospora sorghi* Bain and Edg. Dark-red zigzag or semi-circular spots are first produced on the lower leaves of the seedlings. In the adult stage of the crop, the spots appear in a zonate pattern with grey and deep-red zones alternating. The spots may also appear along the margin or near the midrib. Black and very small sclerotial bodies are produced in the tissues of the older leaf-lesions.

Leaf Blight caused by *Helminthosporium turcium* Pass. The leaf-spots produced by this disease are spindle-shaped, straw-coloured, with a slight green tinge. In severe cases, the spots may cover the entire leaf-blade, thus producing the blighting effect.

Bacterial leaf-spot caused by *Pseudomonas syringae* V. Hall. The spots are small in the beginning, but enlarge very rapidly involving a major portion of the leaf in the form of red stripes. The centres of the spots

CONTINUED ON PAGE 38

You Can't Afford to Ignore Pullorum Infection

by

S.B.V. Rao
Poultry Research Division
Indian Veterinary Research Institute
Izatnagar

MAYBE the Bacillary White Diarrhoea, or the Pullorum Infection, does not kill all the baby chicks it attacks, but the 25 to 50 per cent that survive are a greater menace: they carry the infection to the future generation.

You have reason to suspect the disease in your flock if

(1) the hatching percentage is low (due to many "dead in shell" embryos) ;

(2) from the first week onwards, the brooder chicks tend to huddle under the hover, suffer from white, watery evacuations, pasted vents and difficult breathing, and deaths begin ;

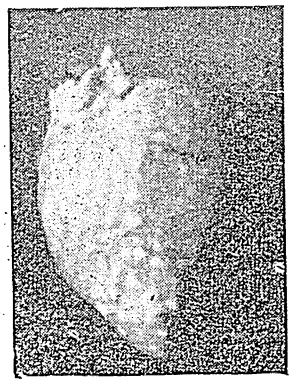
(3) the egg-yield of the flock is lowered, some hens die of yolk "peritonitis" and others have persistent watery motions.

The Pullorum Infection is caused by the germ *Salmonella pullorum*. The germ selects the ovum as its seat of mischief. It is present in the egg-producing organs (ovaries) of adult hens that contracted the disease as chicks, or even later.

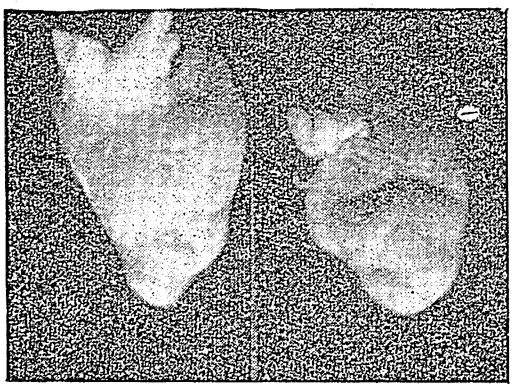
From diseased ovaries, the germ passes into the yolk of the eggs laid by infected hens. The yolk remains inside the body cavity of the day-old chick to provide it nourishment for about 94 hours by slow absorption into the intestines. Thus it gains entry into the system of the chick and produces the disease. From the intestines, the germ gets into the liver and then into the undeveloped ovaries.

The healthy ovary of a hen consists of a cluster of round-shaped ova or yolks varying in size from a pinhead to the full-size yolk of a hen's egg. The undeveloped ova are small and greyish-white ; as they mature and attain the usual size, they become orange or yellow. Each ovum is attached to the body by means of a short stalk.

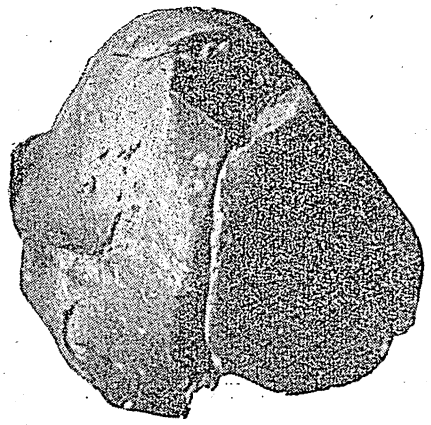
The affected ova, on the other hand, are misshapen and discoloured, and their attachments long and thread-like. Sometimes, the ova break in the abdominal cavity and cause inflammation of the lining ("peritonitis"), resulting in the death of the bird. Whereas the contents of a healthy ovum are of the same colour and consistency as the yolk of a fresh egg, those of the infected ones are either more fluid or less fluid and sickly yellow, greenish, or even blackish. Sometimes the sack of the ovum becomes leathery, pits on pressing and is oily. These are usually the unmistakable signs of the disease.



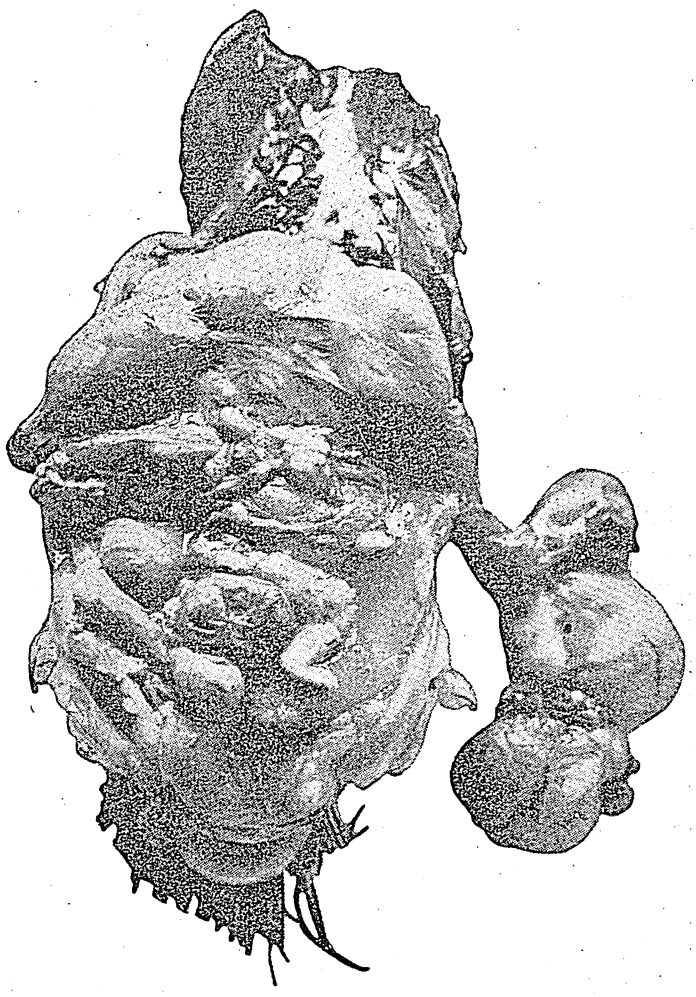
See the pearl-like nodules on the wall of the heart of a baby chick (*right*). **The Pullorum disease has caused these**



The heart also gets misshapen (*left*)



The liver gets enlarged and white areas of dead tissue appear on it



A case of "yolk peritonitis." Shown on right are three abnormal ova with their stalks

IN BABY CHICKS

The disease in baby chicks begins to appear about the sixth day after hatching, reaches the peak by the second week and thumps down by the third week. Sick chicks feel thirsty and crowd round the hover. Panting can be noticed, along with white chalky fluid motions.

On opening a dead chick, pneumonia or congested lungs can be seen. In two to three week-old chicks, the liver sometimes has greyish specks of dead area, and pearl-like nodules develop on the wall of the heart. The shape of the heart is occasionally distorted in week-old chicks.

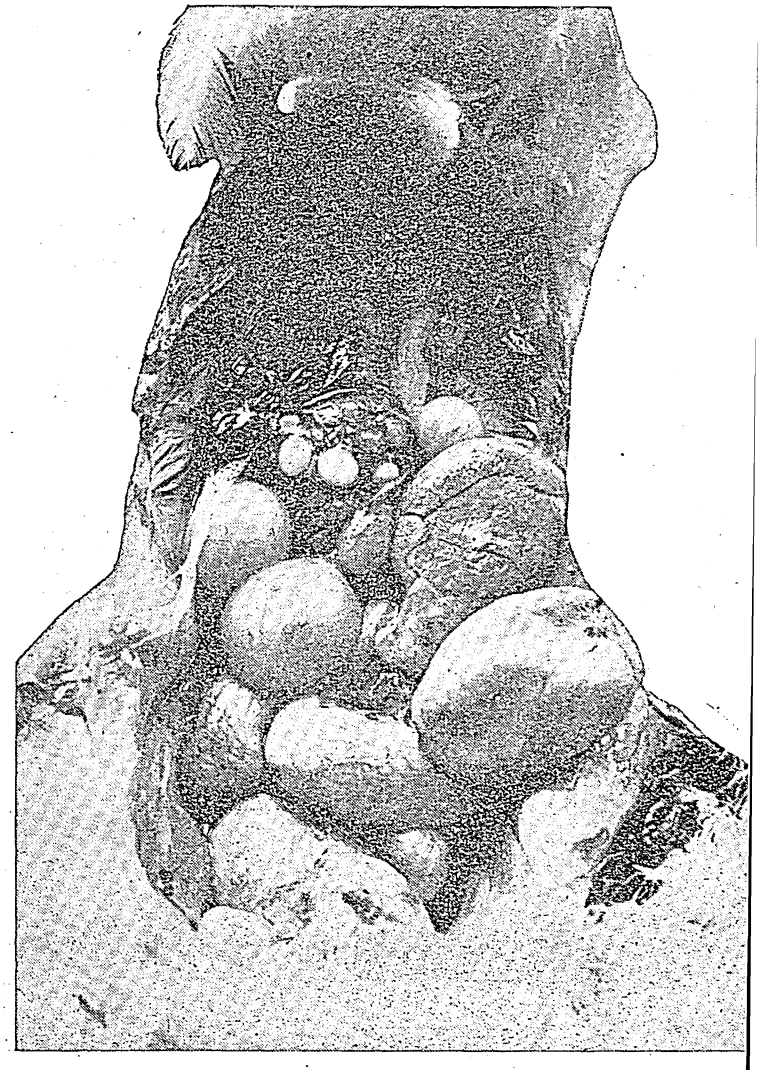
If freshly dead chicks, preserved on ice in thermos, are sent to a Veterinary Laboratory for examination, the germs can be recovered from the heart blood or liver and in positive cases the results communicated within a week with the necessary advice to destroy the hatch and blood-test the breeders. Drugs are of little value in this infection. Some new drugs like "Neftin" and "Furazolidone" do help in curing many chicks, but there is always the danger of some of them becoming "carriers" and continuing the disease in the flock. Therefore, they are best destroyed, unless blood-testing is also done after medication to remove the "reactors."

AGGLUTINATION TEST

The presence of the germ in the body of a hen causes her tissue cells to produce substances called "agglutinins" in her blood. They form a defensive mechanism against the disease by causing the germs that invade the system to clump down when they come into contact with the (specific) agglutinins, so that the white blood cells could devour them.

The presence of these telltale agglutinins can be detected by the use of a testing fluid with killed germs in suspension. A drop of blood from the hen is taken, mixed with a drop of the testing fluid ("Pullorum antigen") on a glass slide and the reaction read. If the hen is diseased, the test CONTINUED ON PAGE 32

Healthy, round ova side by side with disfigured potato-shaped ones in the abdomen of an infected hen



Shells Can Bring More Foreign Exchange

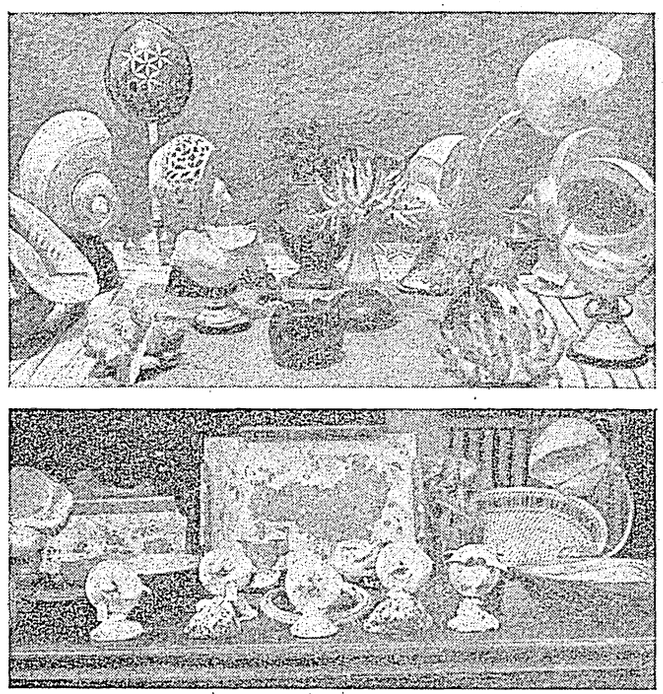
by
Rajinder Kumar
Fisheries Development Officer
Andaman and Nicobar Islands
Port Blair

HOW shell-fishing in the Andaman and Nicobar Islands came to attain the position of importance that it deserves is quite an interesting story.

There are about a dozen species of gastropod molluscs of the genera *Trochus* and *Turbo* occurring in the waters of the Andaman and Nicobar Islands, but only two species, namely, *Trochus niloticus* Linn. and *Turbo marmoratus* Linn. are of commercial importance. These are used in the manufacture of shell buttons, buckles and other fancy goods. The natural habitat of *Turbo marmoratus* is the waters of Penang, Singapore, Andaman and Nicobar Islands, Mergui Archipelago, Australia and New Guinea. The other shell, *Trochus niloticus*, is more widely distributed but the bulk of its catches are made from the waters around Fiji Islands, New Caledonia and Australia. Germany, Austria, France, Japan and the United States of America are the countries where enormous quantities of these shells are utilized every year for the manufacture of shell products.

In January, 1927, the Tahsildar at Nancowrie (Nicobar Islands) reported to the Deputy Commissioner of Andaman and Nicobar Islands at Port Blair (Andaman Islands) that he had seen a motor-boat with a lighter in tow, manned by the Japanese, in the Nicobar waters, and that the object of their visit seemed to be collection of shells in that area. In September, 1929, the Captain of the S.S. "Ahmedi" reported to the Shipping Officer at Port Blair that he had sighted a motor-cutter near the Table Islands which was most likely engaged in collecting shells from the Andaman waters.

Accordingly, in October and November, 1929, several surprise cruises were made by the Engineer and Harbour Master at Port Blair, and he found 21 Japanese boats fishing in the coastal waters of the Andamans. On a careful search, 31½ tons of *Trochus* and 7½ tons of *Turbo* shells were found in the holds on board these boats. The entire collection was confis-



Fancy goods of high artistic taste made out of shells

cated and the masters of the boats were suitably fined, but this did not discourage the Japanese poachers.

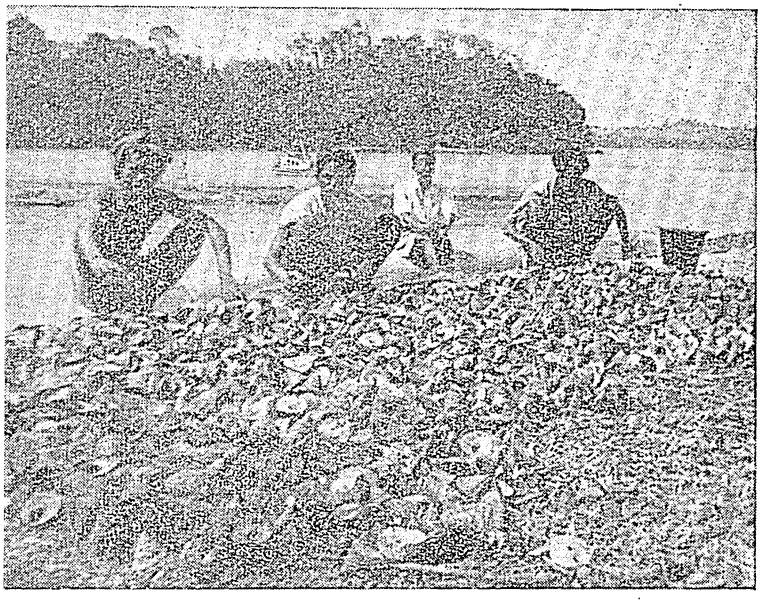
In the absence of suitable patrolling vessels with the Andaman and Nicobar Administration to keep a check on poachers, the authorities decided to issue licences to the Japanese boats for collecting a reasonable amount of revenue from the shellfish resources. But as the conservational aspect of the problem was considered to be even more important, the Director, Zoological Survey of India, was requested to make arrangements for a detailed study of these molluscs for the proper management of the fishery.

Senior zoologists of the Zoological Survey of India were, therefore, deputed from time to time to study the various aspects of the shell fishery in the waters of the Andaman and Nicobar Islands and to suggest

suitable measures to make the industry a permanent source of revenue to the Administration. The scientists made preliminary observations on the breeding habits, age at maturity, longevity and natural enemies of these shells. Attempts were also made to study the density of population and the charting of the shell beds.

But as their observations were of a short duration, it was felt that more accurate data should be obtained to put the industry on a proper footing. Detailed observations on the shell *Trochus niloticus* were, therefore, made in the years 1932-35 and the following conclusions arrived at.

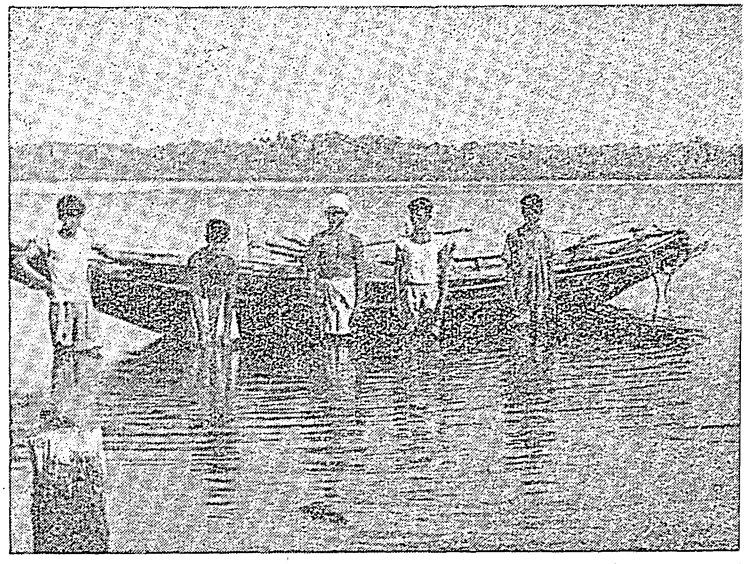
(*i*) The maximum diameter at the base of the shell at maturity is nine centimetres, which is attained in the third year. The shell grows to a diameter of



Trochus **shells spread for drying in Guitar Island**

up to five centimetres in the first year, five to eight centimetres in the second, eight to ten centimetres in the third and ten to eleven centimetres in the fourth and fifth years. Under normal conditions, the animal lives for about ten years and reaches a maximum diameter of 15 centimetres. As the shells mature when they attain a maximum diameter of nine centimetres, it is absolutely necessary that immature shells below nine centimetres in diameter are protected up to the time of full maturity, so that they may spawn at least once in their mature stage to replenish the shell beds. Thus, a maximum diameter of nine centimetres was proposed to be the minimum size limit for the fishing of these shells.

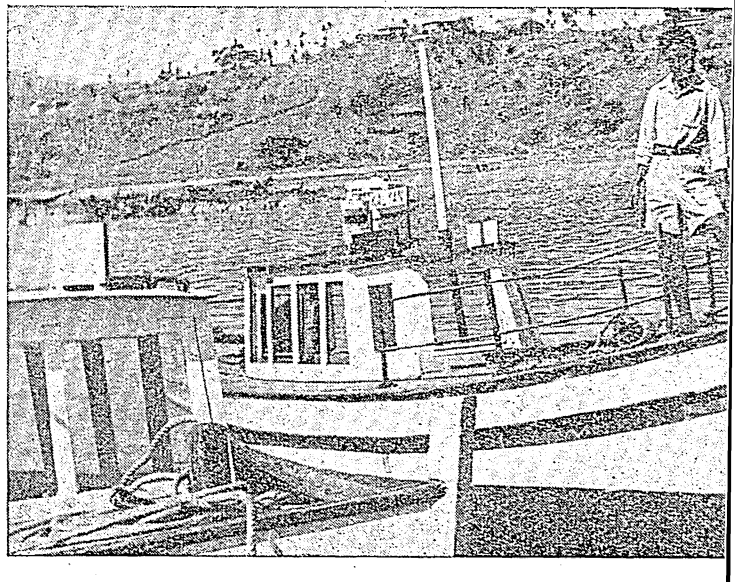
(*ii*) A study of the breeding habits of *Trochus* revealed that an intensive spawning of this shell took place from April to May, and then in October. April to



A *sampan* **ready to leave for the collection ground. The two divers on the right are seen wearing the goggles**

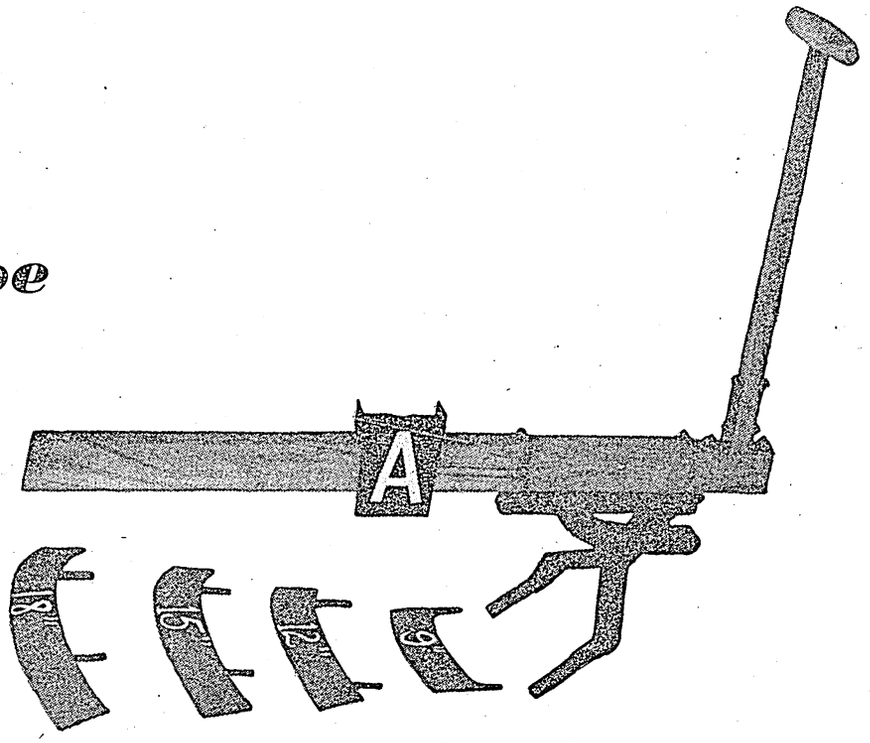
September, when the sea around these islands was generally rough due to the onset of the South-west Monsoon, was proposed to be prescribed as the close season as, during this period, it was not possible to make shell collections, and, at the same time, the animals spawned intensively.

(*iii*) It was estimated that with judicious exploitation the yield from these beds could be maintained more or less stationary at 200 to 300 tons per annum. As the shell beds were found to have been indiscriminately exploited for many years by the Japanese, adoption of stricter measures to enforce the legal minimum size limit was suggested to restore the beds to their former populous condition. CONTINUED ON PAGE 38



These two shell-fishing boats in Phoenix Bay are awaiting inspection by the Engineer and Harbour Master at Port Blair

The "Anand" Hoe is a Better Hoe



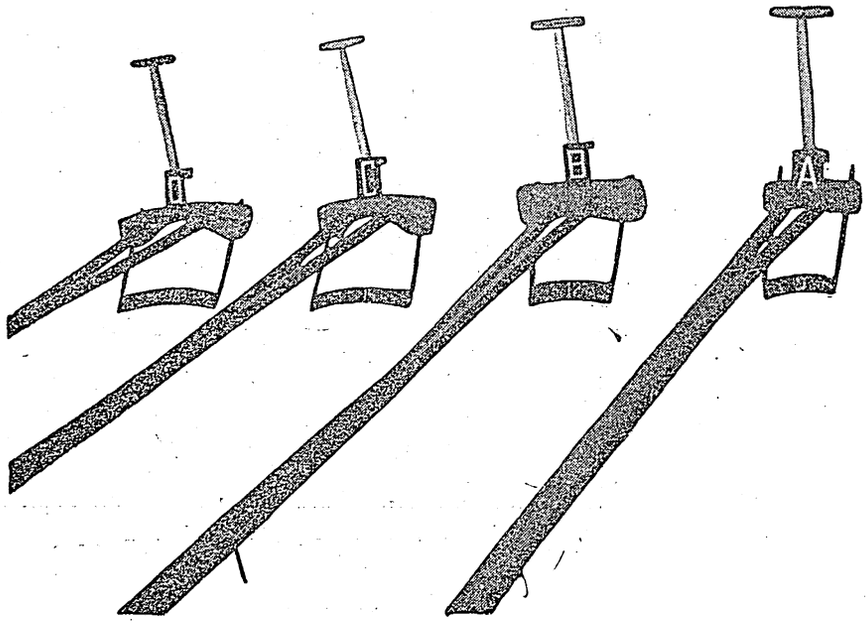
The "Anand" hoe

by
S.M. Patel
B.A. College of Agriculture
Anand, Bombay State

THE Anand Institute of Agriculture has succeeded in giving farmers a hoe which is much superior to the interculturing implements at present used by them; it is the "Anand" hoe.

The new hoe has all the qualities that go to make it attractive to the farmer. It is suitable for interculturing in crops like *bajri*, *jowar*, wheat, vegetables and tobacco—so it replaces at least four traditional hoes. It is simple in design, can be made by the village artisan and does not call for frequent repairs—so the initial as well as the maintenance cost are not much for even the ordinary farmer. It is of a sturdy build, which makes it quite durable, can be adjusted to suit bullocks of varying heights and sizes and, above all, gives a very efficient performance.

Some of the traditional hoes used by farmers



A hoe is a light type of cultivator generally used for uprooting weeds by inter-row cultivation between crop-rows. The local hoe essentially consists of a long, narrow blade with a cutting edge supported by two prongs at each end, which are fitted on to a head-piece. A handle and a long wooden beam, either bifurcated at one end or made up in a pair, are fixed to the head-piece. The implement is hitched to a pair of bullocks through the beam and is guided by the driver by means of the handle.

LOCAL HOE

The construction of the local hoe is such that only one blade of a particular length can be fixed to

it. Such a hoe has the following disadvantages.

Each unit can take only one type of blade. This necessitates the possession of a number of hoes to be used in different row-widths. For example, an average farmer growing four to five crops of different row-widths, viz., 12 inches, 15 inches, 18 inches, 21 inches and 24 inches will need at least four hoes with blade lengths of nine inches, 12 inches, 15 inches and 18 inches, respectively.

The head-piece of the hoe is always longer than the length of the blade. This makes it quite unfit for use in crops where the vegetative growth covers a certain portion of the row. This disadvantage is particularly marked in the case of tobacco wherein many leaves get damaged by the head-piece of the hoe. The farmer has, consequently, to restrict himself to the use of a much smaller hoe, thereby decreasing the efficiency of work ; alternatively, he has to sustain a loss due to breakage of leaves and damage to plants.

The materials used in the construction of the hoe and the design in general are traditional and rather arbitrary; these are not based on any principles of design or strength of materials. The wooden head-piece and its joints with the beam and the handle are weak from the design point of view. Thus, there are chances of the implement snapping at these weak points.

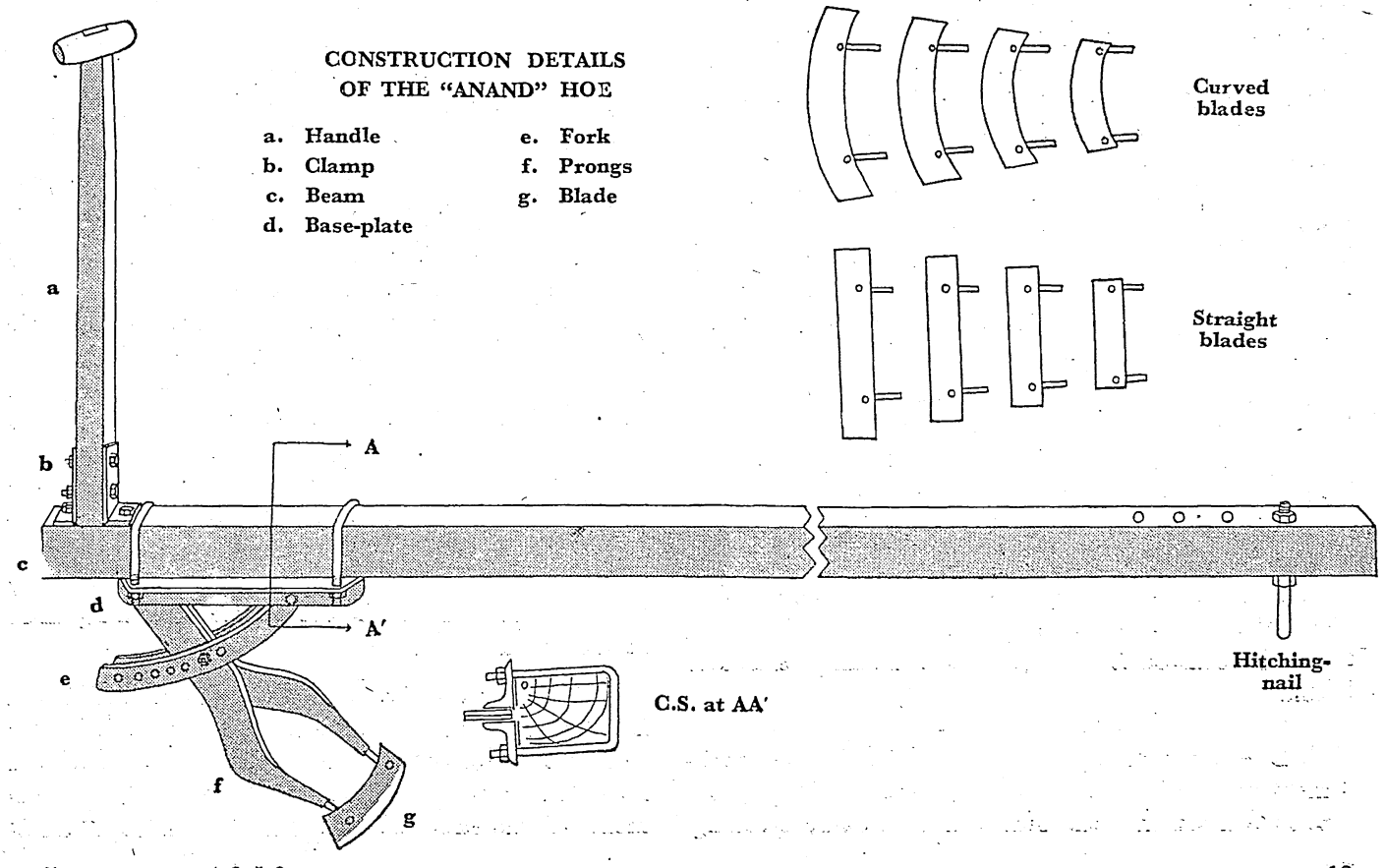
THE NEW HOE

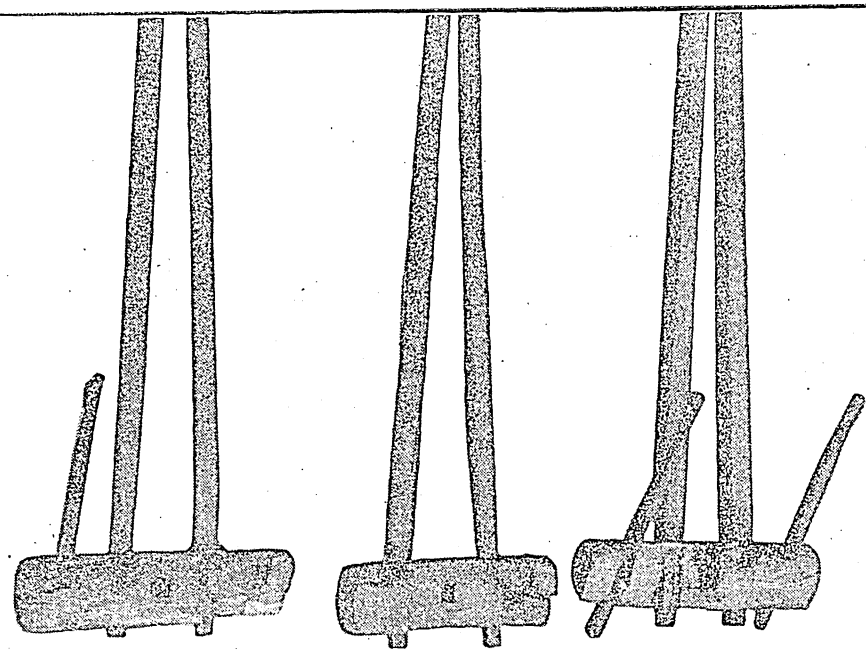
In designing the new hoe, an attempt has been made to overcome all these drawbacks. The general shape of the Anand hoe is not much different from that of the local hoe except that it has incorporated all possible advantages and is nearly perfect in its design and performance. It has, therefore, found ready acceptance by the farmer.

The new hoe is composed of (*i*) a beam or pole with a hitching-nail, (*ii*) a base-plate with U-clamps, (*iii*) prongs, (*iv*) blades, (*v*) a fork, and (*vi*) a handle with grip.

The type of wood used for beams depends upon cost and availability. Keeping this in view, the beam is prepared from the local *babul* wood of appropriate size. At one end it is fitted to the base-plate through U-clamps, while at the other four holes are drilled to house the hitching-nail.

The base-plate is prepared out of two pieces of $1\frac{1}{2}$ inches $\times 1\frac{1}{2}$ inches $\times 1/8$ inch m.s. angles. It holds the fork at one end and the prongs at the other, both through pin-joints. Specially prepared U-clamps pass through the holes in the base-plate and hold the beam when the nuts of the U-bolts are tightened.





The weak points at which the local hoes snap

The prongs are specially designed to form an inverted Y shape when they are paired. At the top end, where both the prongs are joined together, necessary holes are provided for a suitable connection with the base-plate and the fork; at the other end, special sockets are prepared to hold the blade-pins. The distance between these sockets is kept constant.

The blades are prepared in different working lengths. All the blades are fitted with special blade-pins in the central portion, keeping the distance between the two pins constant for all the blades. Due to this provision, a blade of any working length can be fitted on the prongs of the hoe. The blades are slightly curved, having a convex edge. They are shaped in such a way that the edge remains in one plane at a particular angle of work which is the most common in use. The curvature helps in pushing the rubbish material towards the ends, which otherwise would stick to the edge and reduce the efficiency of work. The blades are either prepared from special steel or from ordinary mild steel, subsequently case-hardened to obtain a hard core to reduce wear and tear of the blades to the minimum.

The fork for changing the angle is attached to the base-plate at one end and to the central portion of the pair of the prongs at the other end, both the joints being pin-joints. At this end, a few extra holes are provided so that any one can be used according to the angle of work desired.

The handle is prepared out of local wood and is identical in shape to that of the local hoe. It is fitted to the beam directly through two L-clamps and four bolts.

WHY SUPERIOR

Due to the special facilities provided for the attachment of blades, any blade of suitable working length can be fitted into the same unit. Broadly speaking, any of the blades having a length of nine inches, 12 inches, 15 inches and 18 inches can be fitted on the Anand hoe. Thus, it helps to replace four traditional hoes costing about Rs. 60. The farmer has, therefore, to keep only one unit in place of four local units. This saves a considerable amount of capital and maintenance cost as well as storing space.

It is an established fact that the draught, depth of cut and turnover of the soil depend on the angle of work, which has to be adjusted according to the different soil and crop conditions under which hoeing is done. The traditional hoe has the beam and the prongs rigidly fixed to the head-piece, giving no chance to change the angle of work; in the Anand hoe, special facilities are provided in this respect. Thus, the Anand hoe provides an extra facility for selection of the desired angle of work, which leads to increased efficiency and perfection in the quality of work.

The head-piece provided under the beam of the Anand hoe will cause no damage to crops that have a spreading habit of growth. Actually, the whole structure of this hoe is such that it does not interfere with the crop plants at all. On account of this facility (*i*) interculturing can be done on wider strips in rows, increasing the efficiency and perfection of work and (*ii*) crops can be protected from unnecessary foliage losses that may affect their yields; this advantage is marked in the case of tobacco in which the ordinary hoe does damage the leaves either by breaking the same from the petiole or tearing them at the edges.

The beam is without any bifurcation and hence is not reduced in cross-section at the joint with the head-piece, as is done in the traditional hoes. In view of the forces acting on the implement, all the structural

CONTINUED ON PAGE 39

A. I.

Will Aid

Poultry Farmers

by
M. Bettiah
Poultry Development Officer
Mysore

ARTIFICIAL insemination has already come to poultry, and the advantages offered by it are many.

With proper feeding and management, artificial insemination would be a good supplement to natural mating to increase fertility in poultry flocks; a 20 to 25 per cent increase may not be too much to expect. It can be used with the greatest economic advantage in turkeys, as low fertility is a problem in breeding them by the natural method.

Artificial insemination can even be relied upon as the sole method of breeding, the males being never placed with the females. Depending upon the breed, one male is sufficient to fertilize the eggs of 30 to 40 females. That would mean a less number of breeding males to be kept and no necessity of special breeding pens. Quite a saving in feeding costs, space, building materials and labour!

In pedigree breeding and progeny-testing, there is also the obvious advantage of making use of an outstanding cockerel or a proven cock. In cross-breeding, the physical difficulties often met with in mating heavy breeds with light ones are overcome. The technique is also useful: in the production of chicks from birds kept in laying batteries; in the multiple shift system of breeding—a greater control leading to less wastage of

Inserting semen into the oviduct of the hen





The only two things required are a glass tube and an ordinary ink-filler

eggs between each switching of males; for reducing infertility due to defective mating behaviour; for doing away with the problem of preferential mating; for preventing damage to the females in natural mating, especially in the moulting season.

The technique of artificial insemination as applied to poultry is known as the "Massage Technique," and is not a very difficult one. However, it does require a lot of practice to acquire the necessary skill for practising it. It involves two things: collection of semen from the males and insemination of the females. It is being regularly demonstrated to poultry breeders and students of poultry husbandry at the Hesarghatta Poultry Farm in Mysore.

COLLECTION OF SEMEN

Two persons are required—one to hold the bird and another to massage and collect the semen in a glass bulb. The cock bird is held by its thighs loosely with the left-hand fingers and is rested on its breast in a horizontal position on the left thigh of the person holding the bird, its vent facing the other who would collect the semen. The correct holding of the bird is important.

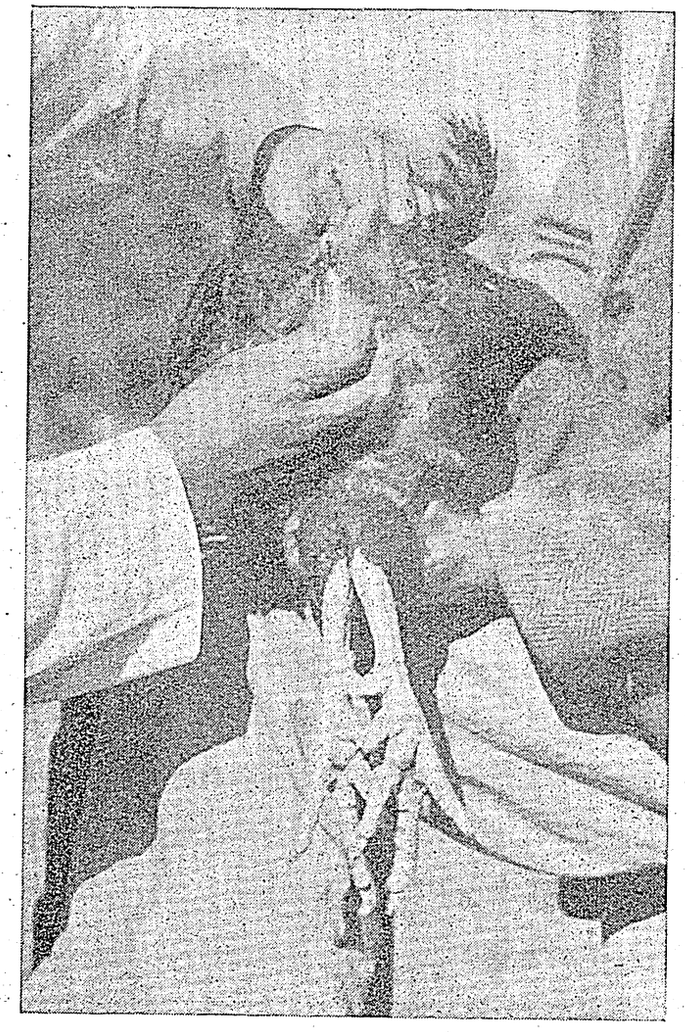
The holder of the bird then gently strokes the back of the bird towards its tail five or six times to cause stimulation. The one who is to collect the semen holds the semen-collecting glass bulb in between the thumb and the forefinger of his right hand; at the same time, he slightly massages the abdominal region immediately below the pubic bones. His left-hand thumb and the forefinger are placed from the top above the vent of the cock for squeezing the semen from the bulbous ducts. In the process of stroking the back and massaging the abdominal region below the pubic bones, the bird gets stimulated and its rudimentary copulatory organ is fully everted.

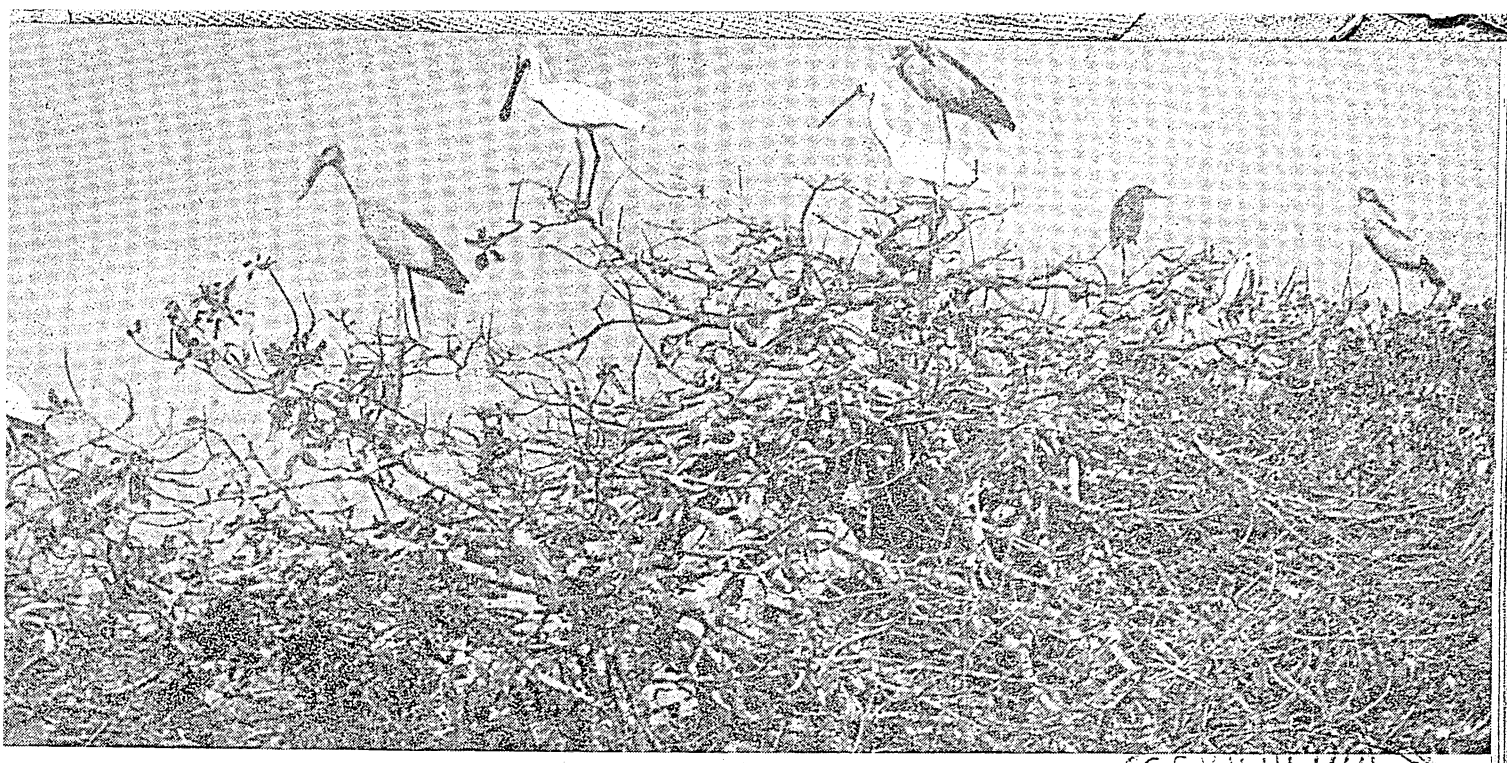
The final step is the actual milking process. The left-hand thumb and the forefinger are slowly slid downwards along the vent and the collection bulb is brought into place from below, and the semen collected. The process may have to be repeated once or twice to collect the required quantity of semen. When all the semen has been collected the bird is released.

The cocks that are used for collection of semen are to be kept in individual cages for easy handling and to prevent fighting among themselves. For increasing the longevity of the cock and for a long-term programme, semen is collected every alternate day, the quantity depending upon the breed and the individual cock. In light breeds, like the Leghorns and Black Minorca, 0.5 ml., and in heavy breeds, like the Rhode Island Reds,

CONTINUED ON PAGE 31

This is how you collect semen from a donor





Spoonbills and openbills nesting in the Vedanthangal heronry

LIBRARY

GOOD CROPS WITH BIRD GUANO

by

P. J. Sanjeeva Raj

Madras Christian College, Tambaram

IT is remarkable that though we have little information on the agricultural use of bird guano, the villagers of Vedanthangal in Madurantakam taluk of Chingleput district of Madras State have been manuring their paddy crops with it since at least 1798. The heronry at the village is the oldest bird sanctuary on record in India, and its preservation to this day is entirely due to the protection to birds offered by the villagers. Special watchmen are employed by the village *panchayat* to guard the sanctuary when the birds come and breed there in large numbers during winter.

The heronry is only a temporary irrigation tank of about 74 acres, entirely dependent on rain water. There is a grove of about 540 trees of *Barringtonia acutangula* (Indian oak, Tamil *kadapai mazham*) in the middle of the tank, with a few of them growing along the tank bund. These trees are particularly well-suited for the nesting of large water-birds of various kinds, like openbills, cormorants, grey herons, night herons, pond herons, white ibises, darters, etc.

After a good monsoon, the tank may be 15 feet deep in the middle, so the birds are beyond the reach of human beings or predators, except kites and water-snakes. The birds, especially cormorants, openbills and night herons breed here in thousands. They arrive usually in batches just when the tank begins to fill up after the monsoon from September to November, nest and breed during winter and desert the place before the tank gets dried up by about April.

By about November-December, when all the birds would have just come and settled down, the water in the tank is mere muddy rainwater. Slowly, it acquires a green tint because of bird droppings falling into it; by about February, it gets saturated with the bird excreta and develops a deep olive-green colour, an oily appearance and a strong foul odour.

This guano-saturated water, strangely enough, is drunk not only by cattle but also by men occasionally with no ill effects. The water is so foul-smelling in February that it attracts snakes in the vicinity. The

water is drained through five sluices to the surrounding paddy fields on the southern and south-western sides and nearly 128 acres of wet land, where paddy is the main crop, are irrigated with it. It is said that a higher rate of revenue used to be collected from the lands irrigated by the guano-concentrated water.

TWO CROPS

Two crops of paddy are usually raised on these lands—one from July to December and the other from January to May. The water-dissolved guano is so valuable for paddy that no other manure whatsoever—neither the usual green manure and oilcake nor the superphosphate and ammonium sulphate, etc. —is used.

But since the first crop is planted in July when no birds would have yet come to the sanctuary, all the early stages of the crop get merely the rain water collected in the tank with no guano in it. Hence, those who can afford, use a little green manure or oilcake for the first crop alone, but the majority use nothing at all.

Night herons breed in thousands at the Vedanthangal heronry



Especially the second crop, since it is planted in January when the tank water is saturated with guano, not only needs no other manure but also shows an appreciable differencein the average yield per acre over the first crop, as seen below:

The first or second crop with oilcake and superphosphate alone (no bird guano at all) in similar type of soil in the same village	3,000 pounds
The first crop with a dilute concentration of bird guano for only the later stages of the crop	2,250 ,,
The second crop with guano-saturated water for all stages of the crop	3,250 ,,

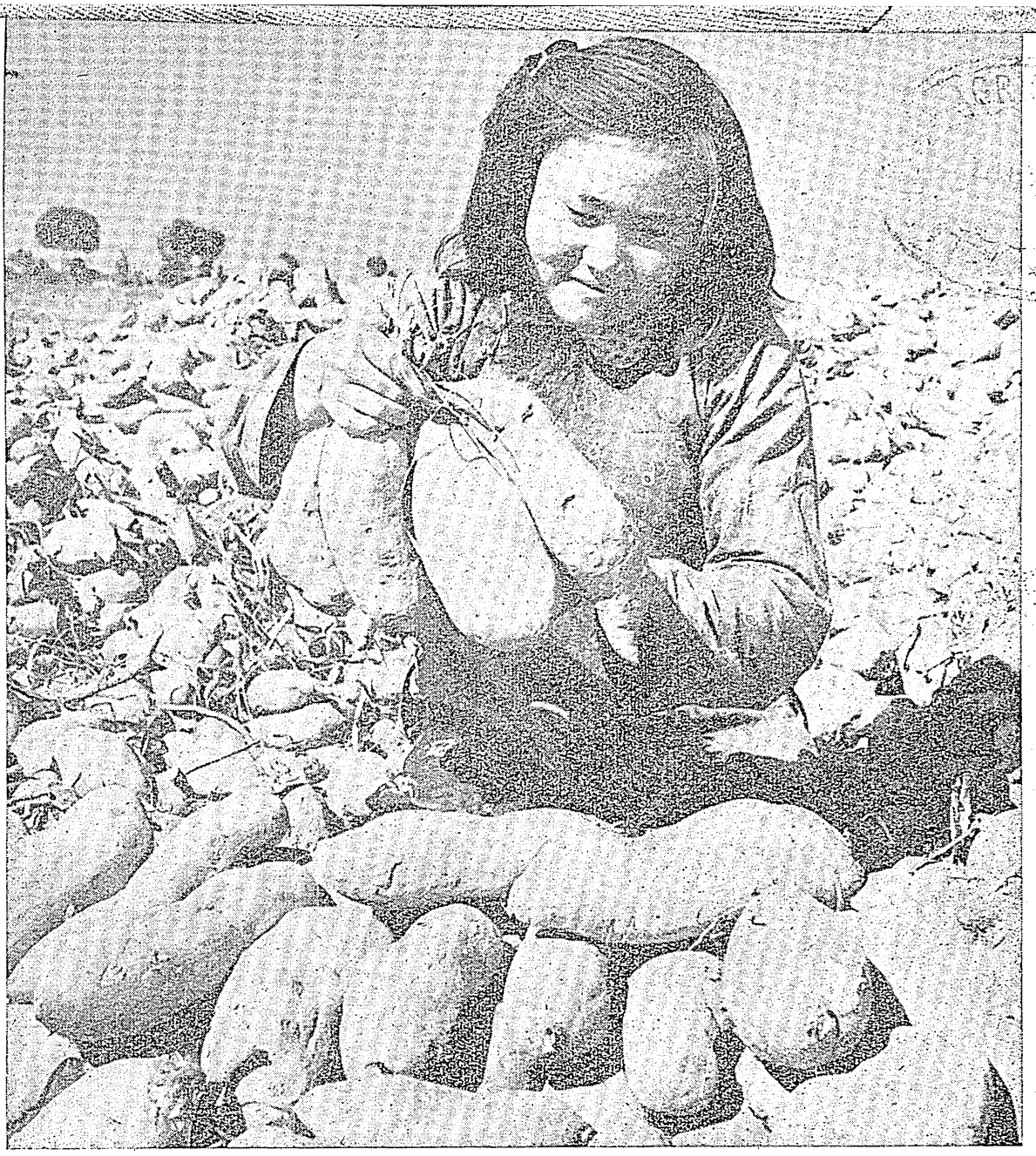
Moreover, the crop raised with bird guano as manure is much more luxuriant, and about 4½ feet tall; it definitely has a better growth than one raised with superphosphate and oilcake which attains a height of only about three feet in similar type of soil in the same village and irrigated by the Madurantakam and Valayapattur tanks, respectively.

Besides, the owners of the irrigated paddy lands are relieved of the burden of purchasing organic (bulky and concentrated) and artificial manures worth about Rs. 200 per acre every year. This means quite a saving for the ordinary farmer. Moreover, the labour of collecting, transporting and distributing the manures over the whole field, as in the case of green manures, is saved.

RICH COMPOST

There is yet another economic and equally important aspect. It is only one part of the guano, the "soluble guano," which gets dissolved in the water, that is used for paddy. The other part, the "guano-leached," which is insoluble in water, gets deposited in a thick layer on the bottom of the tank. To this get added enormous quantities of *Barringtonia* leaves, decomposing bodies of dead chicks and adult birds, egg-shells of the thousands of breeding birds, their fallen feathers, innumerable gastropods like *Limnaea* and *Planorbis*, their shells, etc. All these decompose under-water for about three months at least, forming a thick deposit of a very rich organic compost in the tank bed, sometimes four or five feet thick in the middle. The villagers are allowed every year, after the tank dries up in April, to collect this compost free of charge for the use of their dry lands on the northern and eastern sides of the tank and elsewhere, where usually groundnut, *ragi* and pulses are grown.

CONTINUED ON PAGE 40



King-size sweet potatoes that made up the 600-ton-a-*mou* yield obtained by the Hanchiawa People's Commune

Farming Elsewhere

WHAT I FOUND NEW IN CHINESE AGRICULTURE

by

Dr. Panjabrao Deshmukh
Union Minister for Agriculture

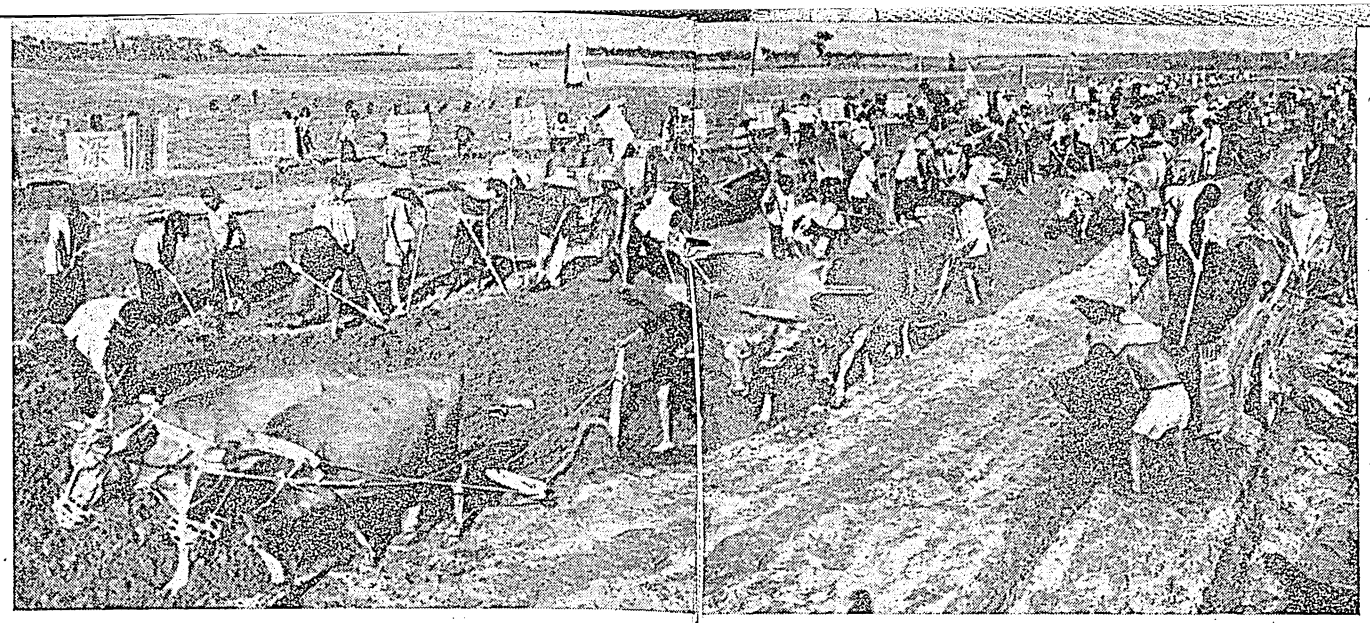
MANY have observed that Chinese agriculture even before the liberation was of a high order. The yields were by no means low although they were not as high as those in Japan. But to see in actual practice the way the Chinese cultivate their fields was quite a revelation to us. Firstly, the Chinese cultivation is very clean. The Japanese are well-known for obtaining high average yields and they sometimes style agriculture as horticulture. The Chinese agriculturists, in fact, are not any degree less careful, probably more. Whereas the Japanese sow everything in lines and often in



Abnormally tall—ten to 12 feet, tobacoo crops raised in China have multiplied their tobacco yields

cross-rows, the Chinese appear to do it regularly and almost everywhere. There are not only rows lengthwise, but the spacings between plants cross-wise are also uniform. The Chinese fields are, therefore, a very pleasant sight to see.

Besides this pattern-sowing, the fields are generally, and in respect of many crops, subdivided into smaller parts at very regular distances, usually from six to eight feet. Between these two parts, a space of about 15 to 20 inches is left open. This is so, not only with respect to cultivation of vegetables but also in the case of ground nuts, soyabeans, maize, cotton and wheat. The amount of care with which this sowing is done astonished me. We saw some fields which were just being prepared for sowing wheat. It was a very delightful sight to see the very regular and highly artistic way in which the water channels were made and the division into regular but smaller plots of the whole area was done. The width and depth of the channels were uniform and even the sides of the channels and subchannels were prepared with meticulous care. The soil on the sides of the channels was not just irregularly heaped up, as is usually the case, but very carefully and properly pressed into definite shapes.



Alongside ploughing, heavy manuring is done layer by layer

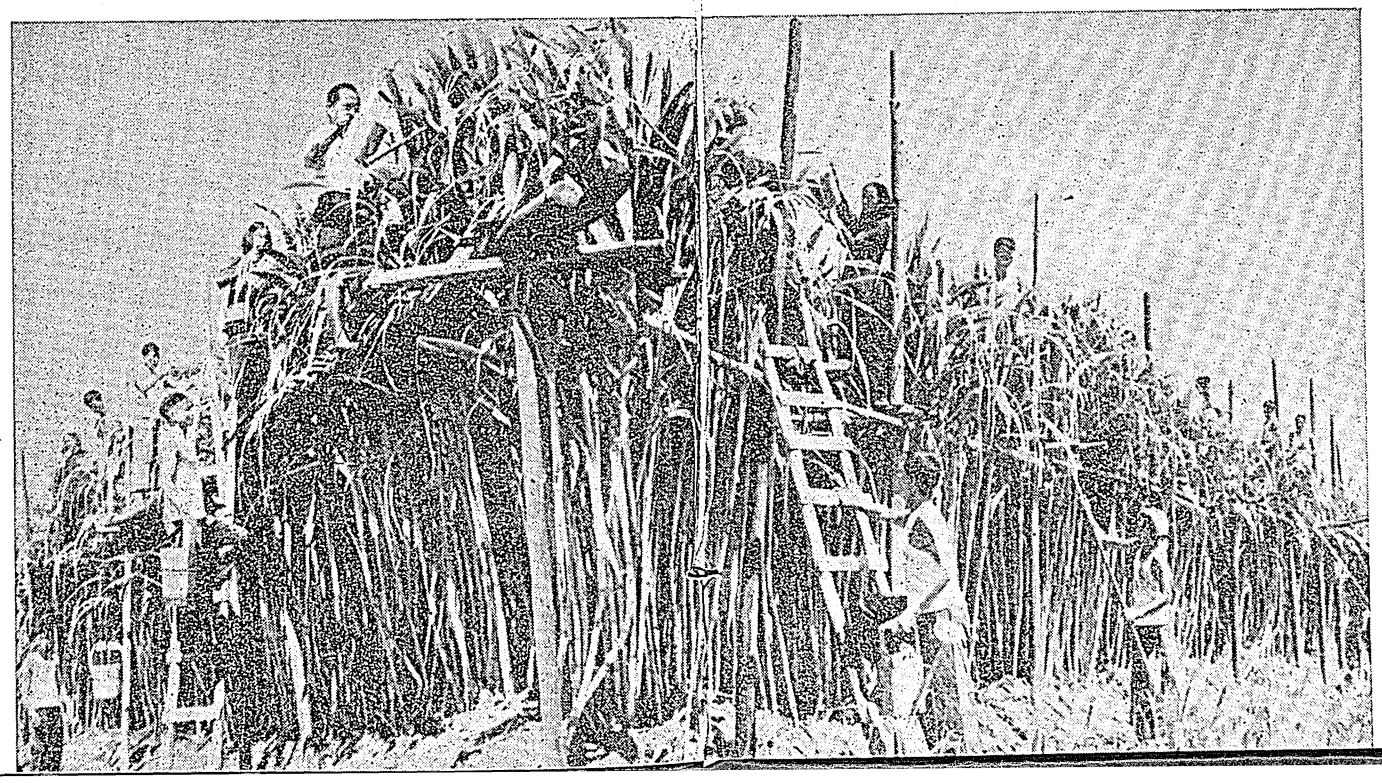
Throughout our journey, we hardly saw a field growing vegetables which was not planted on a raised, curved bed. There was uniformity even in the dimensions and shape of these beds. The breadth was about seven to eight feet with some two feet deep channel for irrigating it on both sides. All vegetable plants were sown in lines which were the same horizontally, not only on each particular raised bed but also throughout the field. Again, every possible piece of land was put to excellent use, including small bits very close to the sloping sides of the road or the railway line. We saw in quite a few places vegetables and flower trees planted by the side of the pavement itself, and that too in cities like Shanghai and Canton. There was not the slightest indication of anybody tampering with these growing plants in any way.

ENTIRELY NEW

What is entirely new in Chinese agriculture is the introduction of deep ploughing since the last couple of years. We have not been able to ascertain how this idea originated, although we were told that the subject was hotly discussed for a couple of years or so However, the whole of China is now engaged on this task on an extensive scale. The target of deep ploughing in respect of only the wheat crop and in only one of the 29 Chinese Provinces is said to be of the order of 5.3 million hectares for the sowing of winter wheat this autumn. This deep ploughing is intended to be the most vital item to ensure that the winter wheat crop will top the all-time record which the Chinese people have reaped last year. It was pointed out that the peasants have already deep-ploughed two million hectares of wheat lands to a depth of one-third of a metre, i.e., nearly 14 inches, after 20 days and nights of vigorous effort. The Chinese claim that deep ploughing when carried out with a heavy dressing of manure adds to the fertility of the soil and helps it retain the moisture and air needed for plant growth. We may note here that on the whole the soil in China is very soft. This may be due to the peculiar nature of the soil and the fact that the rainfall in China is spread over the whole year.

The Chinese people have very few cattle and thus all the farmers cannot utilize them for ploughing. The work has, therefore, to be carried out almost wholly with the hands. Mostly this is done by digging with spades, but in some places some new contrivances for ploughing have been evolved. Power used, however, is purely human labour. One of the devices which we personally saw was a wooden plough with an iron share being pulled by an ordinary coir sort of rope from a contrivance fixed on the border of the field with four persons turning it round. On this they engaged as many as ten people. Whether it is ploughing by human

A sugarcane crop rising to a height of nearly 18 feet necessitated topdressing by scaffolding and ladders



Ten-kilogramme sugarbeets





A lakh of people are said to be daily engaged in deep ploughing being carried out by the Hsiang Cheng People's Commune. The ploughing that is being done here is of a high-yielding plot which they wish to dig to a depth of 14 feet. The crop growing in the background is tobacco

power or with the help of buffaloes or cows or bullocks, deep ploughing is done in layer after layer. Ploughs, as well as carts, etc., are sometimes pulled by one animal and sometimes by two. After ploughing once all the loose soil is removed by men and women with spades and then the plough goes over it a second time and so on, the operation of ploughing and removing the loose earth being carried out as many times as necessary till the required depth of ploughing is reached.

The Chinese people did not seem to possess many tractors although some were seen here and there. Whatever tractors we saw were as a rule old and rather exhausted. We learnt that Soviet Russia was intending to send them a lakh of tractors very soon. But, for the time being, they are depending more on their own hands and the few draught-cattle that they have. The Chinese Government and people are, therefore, laying the greatest stress on deep ploughing at various depths, because they feel convinced that this leads to unprecedented yields.

One or two other things that they do after deep ploughing are: (a) mixing the ploughed loose land with manure and spreading it layer after layer and (b) putting in hollow bamboos at various places so as to permit the gases from the soil to escape and to let in fresh air. These bamboos are not put in too closely but at fairly long distances. They were not very easily noticeable.

HIGH SEED-RATE

The second entirely new and novel feature of Chinese agriculture is the increased seed-rate. While I have preached a reduction in the seed-rate of paddy from the traditional maund or one and a quarter maunds per acre to only about one-twelfth or one-tenth of it, there is a positive drive for increasing the seed-rate in China, especially with respect to wheat and paddy. Of course, this higher seed-rate is recommended for deep-ploughed fields and not so much for others. On the strength of deep ploughing, with of course a few other things already mentioned above, the Chinese claim extraordinarily high yields the like of which has never been heard of in the world before. In one field near Hsien Chen, one-sixth of an acre, which is called *mou* (pronounced moo), the Chinese farmers are said to have produced 1,20,000 catties (a catty is equal to 1.1 pounds). This will give a per-acre yield of (1,32,000 × 6) 7,92,000 pounds or over 350 metric tons. In another plot, they claim to have got 1,06,700 catties or 1,17,370 pounds per *mou*. They pointed out many fields in which they obtained lesser but still unusually



Four Chinese children standing on a very thickly planted paddy crop raised on an experimental plot of 1.01 *mou*

high yields. As a result of all this, the average production in 1958 as well as the total, they say, went up to nearly double that of 1957.

Consistent with the above practice of increased seed-rate they have asked farmers to put in 50 per cent more wheat seed than usual. Even cotton was planted not only in rows but in squares, but the spacing was fairly liberal and comparable to our own. In fact, in many places the Indian seed-rate may be much higher than that of the Chinese. We did not hear of any drive to increase the rate of cotton.

COLOSSAL YIELDS

In the plots where the above colossal paddy yields were obtained, it was pointed out that in addition to deep ploughing the following items were practised:

(1) the water was changed every day;
(2) repeated doses of fertilizers were given every week] or ten days;
(3) there was also spraying and dusting at the same intervals; and
(4) even artificial respiration through electric lights was provided.

High yields are claimed in respect of all crops and the average per-acre yields from the available data for 1956, 1957 and 1958 are as follows:

	Pounds per acre		
	1956	*1957*	*1958*
Paddy (rice)	2,178.00	2,362.80	3,960
Wheat	798.60	752.40	1,320
Potato	1,749.00	1,834.80	—
Soyabeans	745.80	693.00	1,135.20
Cotton	203.28	250.14	528.00
Jute and hemp	1,643.40	1,854.60	—
Tobacco (cured)	910.80	633.60	—
Sugarcane	34,452.00	34,303.50	—
Sugarbeet	9,807.60	8,289.60	—
Peanuts	1,135.20	890.34	2,178.00
Rapeseed	374.88	336.60	481.80

The yields of tobacco also are claimed to be many times more than those in India. It seems they have grown tobacco plants to a height of nearly ten to 12 feet. We did not, however, see the tobacco crop anywhere we went. Probably, it was already harvested or the area where tobacco is grown was different.

The sugarcane yield claimed is 225 tons per hectare, which is said to be a dozen times that of 1957. In

India also we have been able to obtain well over a 100 tons per acre in the South, especially at Walchandnagar in Bombay State. Their claim here, therefore, appears fully believable.

In the case of sweet potato, in the Hanchiawa People's Commune in Tinghsien County, Hopei Province, an excellent crop of sweet potatoes was reaped last year on 5,673 hectares of land. The per-hectare yield from a *mou* of land is said to be 600 tons.

A very thickly planted paddy crop, we were told, averaged a yield of 277.17 tons per hectare on 1.01 *mou* of experimental land. The amazingly high yield was attributed to the application of pioneering farming methods including deep ploughing, close-planting and use of abundant manure. The land was tilled ten times before sowing and ploughed to a depth of one-third of a metre. The rice plants stood close to one another and yielded a total of 7.68 million ears per *mou*. Fertilizers were applied five times. A total of 1.5 tons of green manure, 70 tons of fertile soil, 52.5 kilogrammes of ammonium sulphate, 40 kilogrammes of super calcium phosphate, 90 kilogrammes of bean cake and three tons of natural manure were used. Since the thickly transplanted rice shoots allowed no room to step in, the co-operative members mixed the fertilizers with water and pumped them on to the field by tubes.

REGULAR SPRAYING

The Chinese farmers also do not wait for pests to break out before spraying and dusting. In most places, they do these regularly and frequently. Similarly, they also administer doses of fertilizers with equal regularity.

So far as the cotton yields in terms of lint are concerned, we were told, when we visited a commune which was the headquarters of a county, that the pre-liberation average was only 19 catties or 20.9 pounds per *mou*. In 1957, this rose to 58 catties or 63.8 pounds per *mou*, but in 1958 there was an average increase of 200 per cent over the yields of 1957 in the county. We could not personally verify it but there is no doubt that very spectacular and unusually high yields have been obtained by the Chinese.

One of the things which we have not been able to resolve was whether the Chinese soil and climate are not very propitious for tillerings, or whether the absence of many tillerings was the result of too close a transplantation. When we went to a field which had been harvested and the yield was claimed to be 30,000 catties per *mou*, we had asked as to how many seedlings they had planted on each hill. We were told that unlike the usual method of planting four to five seedlings here, they planted eight to ten, reducing the spacing also to two to three inches. Now, when we counted the number of stems in the harvested field it did not go very much beyond ten, which made us believe that there had been little or no tillering. I do not, however, propose to hazard any opinion before getting some more information on the point.

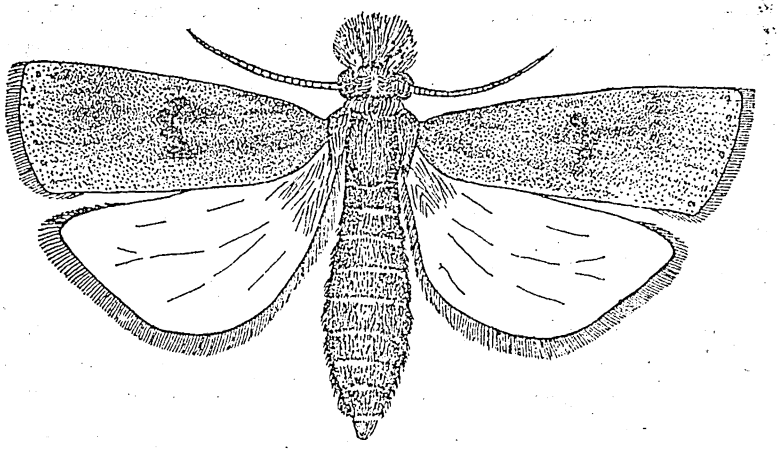
But what I think we ought to do is to undertake intensive experiments in the same way as the Chinese have done, in at least a dozen areas of our country, practising the various things, such as ploughing the soil at different depths, using irrigation water as often as possible, mixing the soil with manures and fertilizers at the time of ploughing, increasing the number of seedlings and reducing the spacing, using insecticides and weedicides, top-dressing heavily and regularly, providing artificial respiration, etc. These items should be tried in their various permutations and combinations.

I would like, however, to say positively that even if the Chinese method is found suitable, it need not be taken to discredit the Japanese method. People should, in fact, be informed that till we come to any different conclusion we must stick to the Japanese method. It might very well be that whereas the Chinese method is suitable in some places, the Japanese method would continue to be ideal in other areas. I have been told by the Chinese people that the deep ploughing and the intensive seed-rate could be expected to give high yields only in areas where irrigation facilities are available in plenty. Of course, the Chinese farmers have not to worry about rats and sparrows, crows and other birds. Hardly any of them was noticeable anywhere, much less a monkey or even a dog.

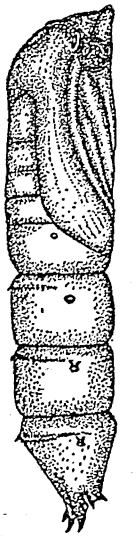
I had asked the Japanese experts for their opinion on the increased seed-rate giving better results. They considered this improbable and the Chinese figures unbelievable. However, it is not unlikely that they may also try the Chinese method in their research centres. The Japanese seed-rate is about the same, if not lower than what Indian farmers put in under the Japanese method, viz., 12 to 20 pounds.

The Japanese also are very pleased with their harvests. In spite of 22 typhoons, which visited Tokyo last year causing serious damage to houses and old walls and buildings, they reaped their fourth bumper harvest. Combined with a steady and fixed price to the growers extending over the whole of this period, the Japanese farmer has become quite prosperous. One of the factors the Japanese mentioned as contributing to better yields was proper attention to drainage. The Chinese deep-ploughing may probably be affording this advantage to the crops they have grown. This may, I think, be borne in mind by Indian research workers also.

AGRICULTURAL LIBRARY



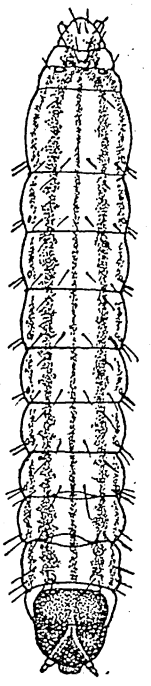
A female moth



A pupa



Eggs



A caterpillar

A New Borer on Paddy

by

M.R.G.K. Nair
Agricultural College
Vellayani, Kerala State

A NEW, potent enemy of paddy has made its appearance in India. It is the stem borer *Proceras polychrysa* Meyr. It was first observed in Trivandrum district of Kerala State in 1956, where it has already lined up with the major pests of paddy and has a field-day from July to January. It attacks the paddy crop in all its stages, and is capable of causing a 50 per cent loss.

Proceras polychrysa is a major pest of paddy in Malaya. In India, at present it seems to be restricted to the southern regions of Kerala State. But it is quite likely that it may extend its area of activity in the country and get established as a major pest, as in Malaya.

Its peculiar habits make *Proceras polychrysa* the most destructive of the paddy pests. The caterpillar first tunnels into the outer leaf-sheaths and then enters the deeper tissues. In this way, it brings death to the whole plant, as different from the death of the central shoot alone caused by the *Schoenobius* caterpillars.

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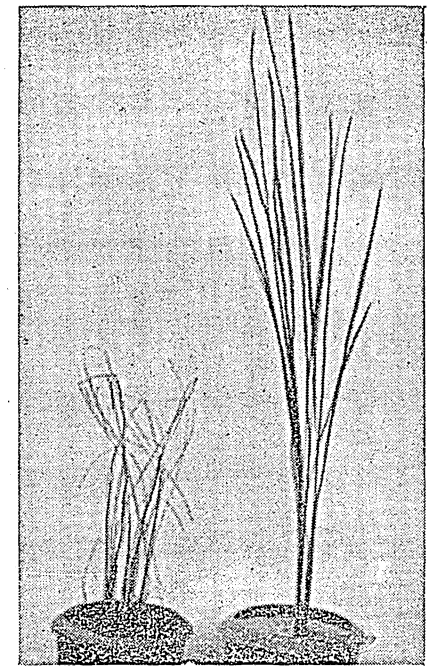
Several caterpillars attack a single plant. After making short work of it, they shift to the nearby plants which meet the same fate. This leads to a complete destruction of all the plants in a clump within a short period, and the tillers do not get time to grow out.

Besides paddy, the pest has also been found to attack *Panicum cruss-galli*, a weed of the paddy fields.

The adult is a small, slender-built moth with brownish-yellow forewings bearing a short row of black, shining and raised spots in the middle and a row of minute golden spots along the outer margin. The hindwings are white. The eggs are laid on the leaves. They are white, flat and arranged like the scales on the body of a fish, overlapping one another.

The eggs hatch in six days. The hatched out larvae first bore into the outer leaf-sheaths and then tunnel within to feed on the internal tissues.

The full-grown caterpillar measures about 21 millimetres in length, is cream-white in colour with deep brown to black shining head and prothorax. The body is striped with five longitudinal light brown stripes: one dorsal, two subdorsals and two laterals. The larval period is 23 to 36 days. Pupation takes place within the larval tunnel, the pupal period being four days. The adult emerges through an exit hole previously made by the caterpillar for the purpose.



This is what happens to paddy plants when *Proceras polychrysa* attacks them. A healthy plant on right highlights the difference

Preliminary trials have shown that the pest can be controlled by spraying with "Endrin" 0.05 per cent or "Folidol E 605" 0.08 per cent. For an effective control, it may be necessary to spray the crop once during the nursery stage and once or twice after transplantation. Of the above two insecticides, "Endrin" 0.05 per cent has been found to be more effective.



DISTINGUISHED VISITOR

The Prime Minister of Ghana, the Hon'ble Kwame Nkrumah (*left*) who recently visited India, is seen here at the Botany Museum of the Indian Agricultural Research Institute, New Delhi

News in Pictures



RADIO-ISOTOPES FOR AGRICULTURE

A significant advance in the field of agricultural research is the progress made by the Indian Agricultural Research Institute, New Delhi, in its work on the use of radio-isotopes in soil fertilization and crop improvement. Picture shows a research worker at the Institute studying the behaviour of radioactive phosphorus



VILLAGERS' EFFORT

People of a village in the Kheragarh Community Development Block in Agra district of Uttar Pradesh widening and deepening the 12-furlong channel built by them to drain off the rain water which was endangering land and crop over a vast area. The drain channel was built in a remarkably short period of time and entirely with the initiative and effort of the villagers themselves



RAT-KILLING CAMPAIGN

As part of the anti-rat campaign in the Union Territory of Delhi, over 400 villagers, school children, Extension staff and leaders of "Teams of helpers" have joined hands to survey an area of over 1,200 acres in the villages of Nilothi and Mahipalpur. The workers have located nearly 30,000 burrows, which now form the target of rat-killing operations



Shri A.P. Jain, Union Minister for Food and Agriculture, inaugurating a symposium on the "Origin, Cytogenetics and Breeding of Tropical Fruits" held at the Indian Agricultural Research Institute in New Delhi, last month. The symposium was conducted by the Government of India and the Horticultural Society of India in collaboration with the UNESCO

HORTICULTURAL SOCIETY MEETS

THE need for a more vigorous role by the Horticultural Society of India in the development of Horticulture in the country was stressed by its President, Dr. M.S. Randhawa, when the Society met at its Seventh Annual General Meeting in New Delhi on 1st December, 1958. The Meeting was inaugurated by Shri K.R. Damle, Secretary, Union Ministry of Agriculture. Addressing the meeting, Dr. Randhawa said:

This Annual General Meeting is unique in the sense that it is being attended by horticulturists of international repute from the U.S.A., U.K., Japan and Ceylon. The message and spirit of Horticulture pervade all strata of society, all walks of life and all countries. In fact, Horticulture is a unifying factor with all its implications of beauty, friendship and goodwill.

The Horticultural Society of India came into existence in 1942 when a group of enthusiastic horticulturists resolved to form a society. After a chequered growth during a short period, the Society has been progressively gathering strength. With barely 20 members on the rolls at the time of its inception in 1942 and 58 in 1949, the Society now claims to have over 400 active members including corporate societies of various regions. The Society is truly representative and is of an all-India character. It has been making serious endeavours to foster the development of Horticulture in all its aspects in the country. The attention given to Horticulture in the Second Five Year Plan is no doubt partly due to the persistent recommendations of the Society for allotting to Horticulture a place in the Plan. *The Indian Journal of Horticulture*, the organ of the Society, covers a wide range of subjects and is a premier journal of the horticultural science in the country. In spite of several difficulties, the Society has been able to bring out this Journal without interruption, mostly on account of the financial assistance given by the Indian Council of Agricultural Research.

The International Symposium on the "Origin, Cytogenetics and Breeding of Tropical Fruits" now in session is the fulfilment of a long-cherished desire of the Society. This would not have been possible but for the responsibilities connected with it having been shared by the South Asia Science Co-operation Office of the UNESCO, and but for the encouragement and financial assistance given by the Ministry of Agriculture. This gathering of research workers from different parts of the world will provide an opportunity to our research workers to exchange views on different aspects and problems of fruit breeding.

The Horticultural Society of India has reached a stage wherein it has to take stock of the horticultural situation now obtaining in this country. There has been increased activity in the field of horticultural research and development with the sanction of schemes under the Second Five Year Plan. Apart from initiating regional fruit stations to work upon local problems, adequate opportunities have been provided for comprehensive research programmes, on both fundamental and applied aspects, connected with plant hormones, micro-nutrients, etc. Many incentives to fruit growers such as distribution of loans for the

purchase of plant material, supply of fertilizers on deferred payment basis, institution of crop competitions and the award of "Udyan Pandit," have been given effect to.

The Indian Council of Agricultural Research is also contemplating the establishment of regional stations for vegetable research. It has also not neglected ornamental gardening. It has already a Committee on ornamental gardening to encourage and regulate schemes of investigations on floriculture. Apart from this, the Indian Council of Agricultural Research has recently organized a Horticultural Development Board to consider problems of growers, the fruit preservation industry, nurserymen and marketing.

NEW IDEAS

An attractive quarterly called *Indian Horticulture* has been started by the Indian Council of Agricultural Research and it has achieved considerable popularity. A number of publications in the horticultural field, books, bulletins and monographs have been published by the Indian Council of Agricultural Research. I am mentioning all this, so that the members of the Horticultural Society may be aware of the several ways in which the Government is attempting to further the development of Horticulture in the country. In all these endeavours of the Government, the Horticultural Society of India can play its part by associating itself with the activities and bringing to the Government new ideas. One of the ways by which the Society can cooperate with the Indian Council of Agricultural Research is by sponsoring Book Clubs to which the Indian Council of Agricultural Research can supply its many publications at concessional rates.

I finally appeal to all members of this Society to work hard for making the Society stronger, so that the Society can work with greater vigour in the service of Horticulture.

In his inaugural address, Shri K.R. Damle emphasized the need for an increased production of fruits and vegetables in the country to meet the present shortage of these protective foods. He said :

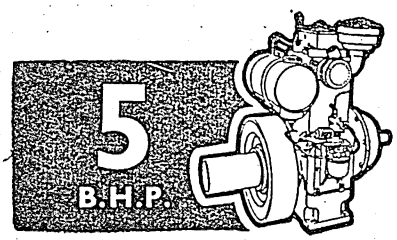
I have been closely observing the progress of your Society and I am happy to note the significant achievements which your Society has made under the inspiring guidance and leadership of Dr. M.S. Randhawa, since I addressed you last in 1954. The willing co-operation from various horticulturists, fruit growers and nurserymen who form the membership of this Society has contributed to the progress of this Central Body of Horticulturists. The Society, during the last two decades of its existence, has made notable achievements in the field of horticultural research. In this connection, mention may be made of the Society's persistent efforts towards the establishment of a Central Horticultural Research Institute. As a result of these efforts, a separate Division of Horticulture was established at the Indian Agricultural Research Institute under the Second Five Year Plan. The Society has also been rendering useful and much-needed service to the horticulturists of this country by regularly publishing *the Indian Journal of Horticulture*. This morning, you witnessed the inauguration of the International Symposium on the "Origin, Cytogenetics, and Breeding of Tropical Fruits," the first of its kind held in India. This is also a singular achievement of the Horticultural Society of India, which organized this Symposium with the active co-operation of the UNESCO and the Ministry of Agriculture. I anticipate that this symposium will be a forerunner to the launching of research projects in fruit breeding leading ultimately to increased production of fruit and an organized development of the fruit industry, not only in India but also in the whole of South-East Asia.

It is also hoped that the Society will undertake an even more intensive programme in furtherance of the cause of Horticulture in this country. The development of the horticultural industry generally means greater prosperity to the farmer and better health for the nation. Some horticultural crops are also a source of increased food production. The Government of India is fully conscious of the role that Horticulture can play in the prosperity and well-being of the country and has launched many schemes of development in the country in the Second Five Year Plan. The aim is that the production of fruits and vegetables should be doubled to overcome the present inadequacy of these protective foods. With assured supplies of irrigation water, more and more area is going under fruits and vegetables every year. This, along with the rejuvenation of the existing orchards, should go a long way in the increased production of these protective foods.

TEMPERATE FRUITS

There is an increasing demand for temperate fruits, especially the apple. The Government of India has already launched a scheme for the development of temperate fruit cultivation in the hills of the Punjab, Himachal Pradesh, Uttar Pradesh and the Kashmir Valley. Special efforts are also being made to develop the dry region of Chini (Himachal Pradesh) for the production of raisin grapes, almond, walnut and pistachionut. Of late, the seed production of European-type vegetables has assumed a national importance because of the stoppage of imports of seeds from abroad. Breeding programmes in these vegetables have to be intensified to meet our national requirements. In this regard, I am happy to note that the Central Vegetable Breeding Substation, Katrain, is doing useful work. All this denotes the extent of work that lies ahead before we can reach the level of

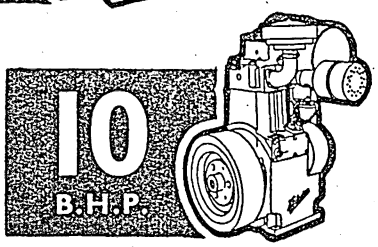
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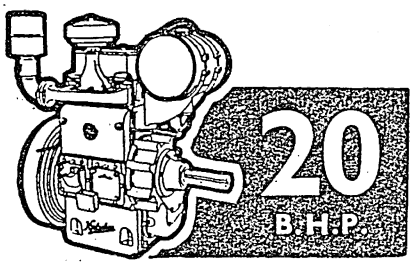
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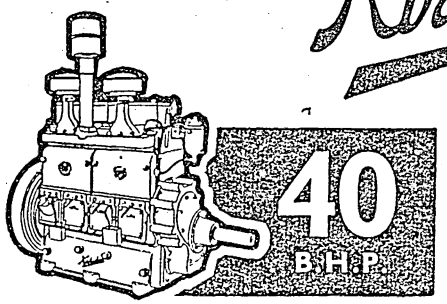
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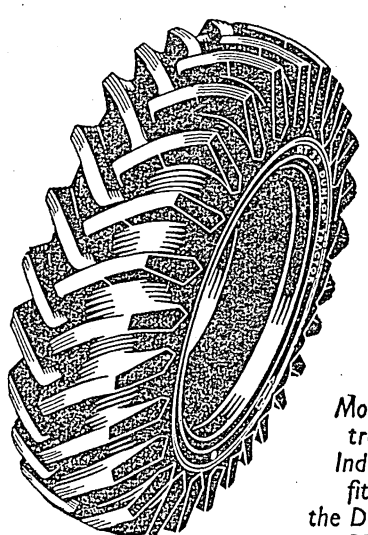
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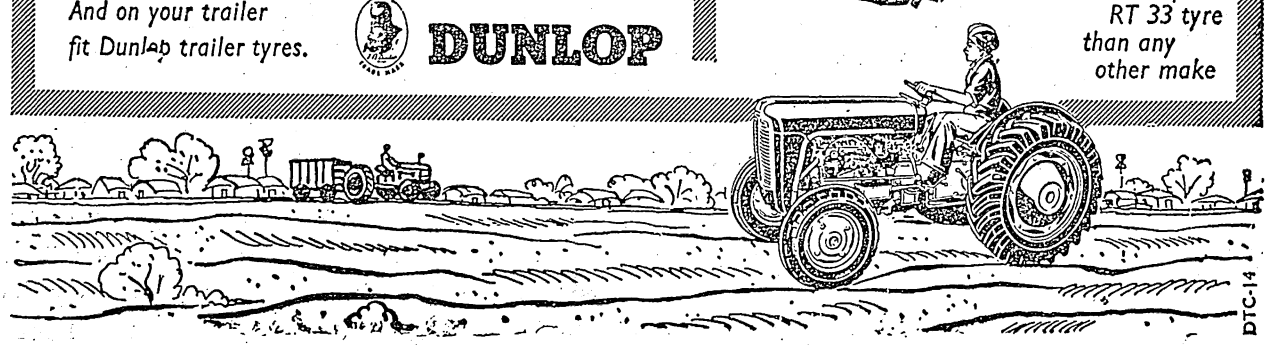
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WHAT'S NEW IN FARMING

COTTON DISEASES

FOR checking the diseases of the cotton crop there are some simple precautions.

For example, not to stock cotton stalks after harvest when there was an attack from one or more diseases on the cotton crop; pulling out the stems immediately after harvest and burning them along with all shed leaves, flowers and bolls.

Research has found new varieties that resist attack from Wilt, a common disease of cotton in many areas. But for other diseases like Blackarm and Root Rot, no disease-resistant varieties are yet available, and hence the farmers have to adopt other measures in checking their spread.

Intercultivating a legume like *moth*, which covers the soil and prevents the soil temperature from rising, is one good way of checking the Root Rot disease. Patches in which the disease has appeared should also be isolated, and in these cotton should be rotated with some other crop.

For Blackarm and Anthracnose, treating the seed with a chemical before sowing has given good results.

In all cases where a disease has appeared, it pays farmers to show the disease-affected plants to the Agricultural Officer of the area so that he may identify the disease and suggest how it can be controlled.

COMPOSTING PADDY HUSK

A GOOD yellowish and powdery manure rich in plant foods can be prepared from paddy husk.

The manure contains, the experts point out, one per cent nitrogen, 1.6 per cent phosphoric acid, one per cent potash and 2.9 per cent calcium, and will be a welcome addition to our half-starved soils.

The method of converting paddy husk into manure is simple, and can be followed by any farmer.

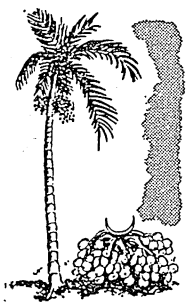
The husk is spread in the cattle-shed as a ten-inch layer. Over this, about nine inches of paddy straw or any other litter is spread.

The top layer is renewed from time to time. But not so the husk layer. It remains there for about six weeks, after which it is removed and put into a pit and composted.

After about nine months, the paddy husk forms an excellent compost, ready for use.

ARECA SEED NUTS

A GOOD arecanut farmer should take sufficient care in selecting the palms from which he collects his seed nuts. He should go only to well-known gardens having a larger percentage of high-yielding trees which are more or less of a uniform age. Palms between 25 and 40 years of age should be preferred.



The mother palms should be selected at the time of harvest by observing their vigour and yield, rejecting diseased and the less vigorous trees; also trees having less than ten open leaves, those with less than four bunches and trees which are poor set. The selected trees should be marked out. In the succeeding years, the marked trees should be observed. After a few years, only those trees which are regularly bearing, high-yielding and are vigorous should be left over. It is from these palms that the seed nuts should finally be collected.

In collecting the nuts, only fully tree-ripe nuts from the second or third bunches should be selected, rejecting all undersized, underweight or malformed nuts. The bunches ready for harvest should be lowered carefully with a rope.

A.I. in Poultry

CONTINUED FROM PAGE 16

Barred Plymouth Rock and White Wyandotts, 0.75 ml. of semen could be collected; this quantity of semen is sufficient for inseminating eight to ten birds without diluents. It is better to remove the feed from cocks about six hours before handling them to reduce contamination of semen with faeces.

Insemination of layers should be done in the afternoons, by which time the majority of them will have laid. A hard-shelled egg in the oviduct prevents the movement of the sperms into the infundibulum portion.

The bird to be inseminated is held by one man who pushes back on the tail with the right hand and supports or pushes slightly on the abdomen. With the left hand, pressure is applied on the abdominal muscles in such a way that the oviduct is everted outside the vent. The oviduct opening is on the left side of the cloaca, and a little pressure by the thumb or finger of the second man at the left corner of the vent will sometimes aid in exposing the opening of the oviduct and permit the insertion of the inseminating glass tube.

The semen is then drawn in the glass tube and inserted into the oviduct, the pressure on the abdomen released and the required dose of semen pushed into the oviduct. Releasing of pressure on the abdomen prevents the flow-back of semen. Thereafter, the bird is released.

The dose of semen recommended for chickens varies from 0.75 to 0.1 ml. once a week, and in turkeys every two weeks. Two persons can collect semen from cocks and inseminate about 200 layers in two hours between 3 and 5 in the afternoon. Dilution of semen with physiological saline just before insemination, will facilitate handling of minute quantities of semen.

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Pullorum Infection

CONTINUED FROM PAGE 9

will show off by clumping down the killed germs which are coloured violet for easy reading. Thus, reactors are spotted out and then disposed of. In such hens, the truth of the test can be proved by recovering the germs from the diseased ova.

1. To prevent the dreaded disease buy chicks or eggs only from known disease-free flocks, or Government Farms ;
2. blood-test all breeders with the Pullorum antigen ;
3. do not import eggs, baby chicks, or laying birds except through the knowledge of our Ministry of Agriculture and that of the Ministry of Agriculture of the exporting country, as only then you would be assured of freedom from this as well as other diseases of poultry not so far found in our country ;
4. wash eggs in a warm solution of five per cent "Dettol" or "Cetavelon" before setting them in the incubator, as this prevents the shell contamination due to some paratyphoid germs related to the Pullorum species (which are also chick-killers) from passing into baby chicks ;

CONTINUED ON PAGE 40

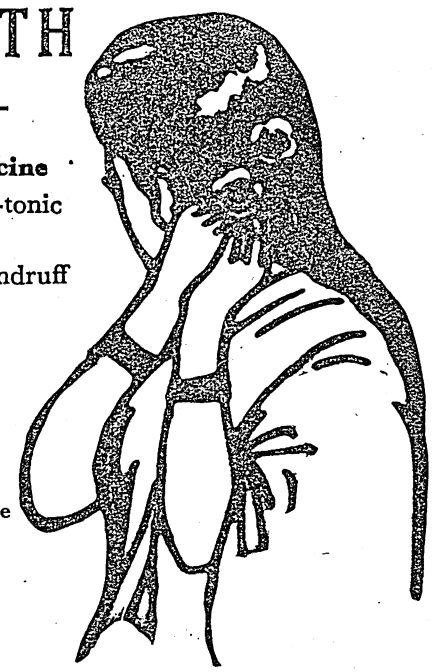
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DON'T WASTE SUGARCANE TRASH

compost it



by

P.P. Chandra

Secretary, Indian Central Sugarcane Committee, New Delhi

and

Chatur Behari

SUGARCANE trash will make valuable manure for your fields if instead of sending it to the waste heap you direct it to the compost heap.

Research at the various sugarcane research stations of the country recommends the following method of composting cane trash, cane leaves, etc. Cattle dung and urine and bulky organic refuse are the other materials used. However, on account of its waxy surface, cane trash takes a little longer time to decompose completely.

A high-lying portion of land near some water channel is selected for the compost heaps. The ground is levelled and, if necessary, rammed with hard *murum*.

The compost heap should be six to eight feet wide, 3½ to four feet high, and of a convenient length according to the material available for composting. If the width or the height is more, the interior of the heap will not get adequate aeration, which may hinder decomposition; if it is too small, the top and the sides will dry up quickly, leaving a large portion of the material undecomposed.

The material for composting is not heaped up straightaway in one lot, but arranged properly in layers. The material is spread about a foot thick and compacted by trampling. A slurry prepared out of dung, ash and earth is then spread over the layer till the whole mass is thoroughly wetted. In this way, four to five layers are put one over the other till the heap is about 3½ to four feet high. The ash, earth and dung absorb moisture and adhere to the surface of the trash, leading to its proper decomposition.

The first turning is done after about five weeks. The turning is started from one end of the heap. The dry material from the top and the sides is removed and spread on the ground, about five feet away from the first heap, and sprinkled over with enough water. Then the second layer from the top is removed and spread on the first layer. This process is continued till the bottom layer comes up on the top of the new heap. The top is then covered or plastered with mud.

Generally, two or three turnings are required for a complete decomposition of the cane trash. The whole process requires 4½ to five months, after which the compost is ready for application in the fields.

There is also another method of preparing compost, the "pit method." A pit six feet wide, three feet deep and 30 feet long (or any convenient length) is dug in a high-lying area where there is a less chance of percolation of water or overflow from the adjoining water channels. The material is arranged in layers as under the "heap method." The pit is filled in layer by layer, till the height of the material is 5½ to six feet from the bottom of the pit, i.e., 2½ to three feet above the ground level.

After a couple of months, the portion above the ground gradually sinks down to the ground level. It is then watered, if necessary, and the top refilled with earth to plug the pit. One or two moderate waterings are necessary during summer. The compost is ready within four to six months and six to eight tons of compost can be secured from each pit. The advantage of the pit method is that no turning of the material is required.

If possible, the temperature and the humidity of the heap should be carefully watched. The temperature in the heap begins to rise after about a week and goes up as high as 50°C ; it should remain at this level for about three weeks. A fall in temperature is an indication for turning the heap. A humidity of 50 to 55 per cent is optimum.

The soil must be fed before it can feed man. A famished soil is a spent force. At "Alembic" we are in touch with the latest developments in fertiliser chemistry, and so are able to offer India's farmers and their "hungry" land a "chemical food" that it vitally needs—ALCHEMPHOS, a mixed fertiliser and first-rate nutrient which enriches the soil and ensures an abundant yield.



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EVEREST

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Did You Get Your Soil Tested?

by

R.V. Tamhane

Division of Chemistry
Indian Agricultural Research Institute
New Delhi

YOU may have no control over the weather conditions, but you can certainly regulate the plant food in your soil to get the best out of crops: a soil test before you sow a crop would tell you what fertilizer and how much of it to apply.

Soil samples from farmers' fields are analysed free of cost at the 19 soil-testing laboratories set up by the Government of India with the help of the T.C.M., and advice on the use of fertilizers given. A total of 24 such laboratories is contemplated—at least one in each state; the remaining five are soon expected to go into action. In course of time, the laboratories are expected to cover large areas and provide information on the fertilizer requirements of individual fields.

So far, nearly 30,000 soil samples have been analysed. More than 70 per cent of the samples have revealed a very low phosphorus content in them. In certain areas in Kerala State, these have been found deficient in potash.

Plants require a continuous supply of certain essential elements for their growth. Some are required in large and others in minute quantities. A good balance between these elements in the soil always pays. Any deficiency in these will naturally result in low yields.

The elements that affect plant growth are nitrogen, phosphorus, potassium, calcium and magnesium. These are found in the soil in different quantities which may be sufficient for a few years, but thereafter require to be replenished by manuring and fertilization. The table below gives an idea of the average uptake of nutrients from the soil by a few important crops.

Crop	*Part of the crop*	*Average yield in pounds per acre*	*Approximate removal of nutrients in pounds per acre*		
			N	*P*	*K*
Wheat	Grain	800	12	8	4
	Straw	1,600	9	2	20
		Total	21	10	24
Barley	Grain	900	4	8	5
	Straw	1,800	6	3	41
		Total	10	11	46
Paddy	Grain	1,000	13	5	3
	Straw	2,000	16	4	41
		Total	29	9	44
Maize	Grain	700	14	7	5
	Stover	1,400	9	3	12
		Total	23	11	17
Jowar	Grain	600	9	6	4
	Stover	2,400	19	4	42
		Total	28	10	46
Bajra	Grain	500	8	4	6
	Stover	2,000	13	3	48
		Total	21	7	54

Now, if we assume that our soils have been under a continuous one-crop system for the last thousand years and the crop was wheat, then the plant nutrients removed from the soil during the period by the plant, at a level of an average yield of 800 pounds per acre, would

be 21,000 pounds nitrogen, 10,000 pounds phosphorus and 24,000 pounds potassium per acre. In addition, there is considerable loss from erosion. All these losses have to be made good by good management, manuring and fertilization.

STORE OF NUTRIENTS

Soils differ in their capacity to hold nutrients. Essential nutrients such as calcium, potassium, magnesium and ammonia are held by clay and organic matter almost as iron filings are held by a magnet. This greatly reduces their rate of movement through the soil and consequent loss through leaching.

The amount of nutrients that a soil can hold depends largely on the type of soil and the clay minerals present in it. For example, a sandy soil has a lower capacity to hold these nutrients than a clayey soil containing a high percentage of organic matter.

Moreover, the plant food material in the soil has to be supplied to the plant in an available form. For instance, over 90 per cent of the soil nitrogen exists in the form of organic compounds of such a nature that this element cannot be utilized by green plants. But, certain soil bacteria can break up these compounds and liberate nitrogen in mineral forms, i.e., nitrate and ammonia compounds, which are readily utilized by plants.

The activity of these bacteria in turn depends upon the soil condition: in an acid soil it is practically nil, in a saline soil it is poor and again in an alkaline soil it is nil. They are very sensitive to changes in soil conditions; too much water or water-logging also affects their activity.

Soil organic matter contains about five per cent nitrogen. Each per cent of the organic fraction then represents 20,000 pounds of organic matter or a 1,000 pounds of nitrogen in the surface soil. The rate at which its breakdown or decomposition takes place is determined by the average climatic factors and the soil texture.

Nitrogen thus liberated under ideal conditions in India does not exceed three per cent. Thus, in a soil containing one per cent organic matter and taking the maximum availability of nitrogen to be 3·0 per cent, only 30 pounds of nitrogen are liberated for plant growth. But, this nitrogen can be lost in various ways and ultimately the plant may get only about ten pounds. The range of available nitrogen depends upon the soil texture and the climatic conditions and can be determined from the percentage of organic matter.

Soil phosphorus is another equally important plant nutrient, but much less is known about its chemistry and behaviour in the soil. Plants may frequently exhibit a phosphorus deficiency even on soils containing several thousand pounds of total phosphate per acre furrow. This anomalous behaviour of phosphorus is due to many reactions in the soil.

The native phosphorus in the soils is found in the form of both mineral and organic compounds, but the availability of soil phosphorus depends largely on the reaction of the soil. In an acid soil, the retention of phosphorus is very great owing to the presence of iron and aluminium in appreciable quantities which "fix" the added phosphate and reduce its availability. In most alkaline soils, the activity of calcium is high; this coupled with a high *p*H favours the formation of more insoluble phosphate.

Phosphorus that is present in an organic compound form in the soils is essentially of three different types and varies between five and 60 per cent of the total phosphorus. This form of phosphate assumes considerable importance in tropical countries. The organic phosphate may also be decomposed or mineralized by the activity of bacteria.

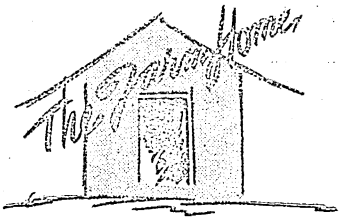
It has been shown recently at the Indian Agricultural Research Institute that not more than nine per cent of the phosphorus applied to the soil in the form of fertilizer is made available to an early variety of paddy; for a late variety of paddy, only ten to 20 per cent is available. The remainder is "fixed" in a very slowly available form. In some types of soil, this availability is only two to three per cent and is controlled by the type of clay minerals present in the soil.

SOIL TESTS

The first thing a soil test can tell us is whether a soil is acid or alkaline. This characteristic of a soil is called "soil reaction" and is referred to as soil *p*H. Soils with a *p*H of 5 5 or lower are strongly acid while those with a *p*H of 8·0 or higher are distinctly alkaline.

Changes in the acidity of the soil may change the availability of plant nutrients in different ways. Phosphate availability in many soils is the highest when the soil is slightly acid to neutral, and declines when the soil becomes strongly alkaline or acid. A *p*H of 8·5 or over indicates an excess of total salts or presence of sodium which limits plant growth and suggests a need for reclamation of soil before application of fertilizers.

Soil tests reveal to us the relative levels of plant nutrients in the soil and indicate the amount of each nutrient needed for economic returns. The amount of plant nutrients needed is related to the crop grown and to the level of available nutrients in the soil. However, it will be some time before perfect correlations are established between soil test values and response from fertilizer application on all important crops in an area and for all the essential plant nutrients.



Keeping Clear of Colds

IS it really necessary to catch that cold now and again every winter? If you are about to say yes, you are wrong. For a few simple precautions, if carefully observed, would keep the nuisance at bay.

And don't ever get into your head that the *common* cold need not be bothered about. Complications that may follow can be quite serious. The commonest are bronchitis and sinusitis. Infection of the middle ear and pneumonia are less common, but more dangerous.

Here are a few good tips for keeping clear of colds.

Start the day well with a good breakfast.

Keep to a diet containing plenty of fresh fruit and vegetables and well-chosen and well-cooked meals. This will keep up your resistance better than any quantity of pills or potions.

No less important is regular exercise in the fresh air, especially when it is sunny. It would keep you fit and less susceptible to colds.

It is always better to feel warm than cold, especially when out of doors. Cold seems to act in the same way as fatigue by lowering the body's resistance. If the body is well-protected by warm clothing, cold air will do no harm to it; if it is scantily clad and shivery, cold air will do no good.

To have too many clothes is also harmful. Smothering children in layer upon layer of thick jerseys and woollen underwear, as some mothers are prone to do, often has the reverse effect. The child gets overheated and sweats, then the sweat cools and he feels thoroughly chilled.

If you can avoid infection, you can sure avoid a cold. Keep away as much as possible from crowded places. Also try to avoid any one you know has got a cold, though this does require the greatest of tact.

You should not feel overtired when you have called it a day. Fatigue lowers the body's resistance to infection and is a sure invitation to a cold. So, try to get plenty of sleep.

Horticultural Society Meets

CONTINUED FROM PAGE 29

production of fruits and vegetables required for the country.

Apart from the production of fruits and vegetables, there is need for greater attention to ornamental gardening than what has been given to it till now. Since achieving independence, the Government of India has been specially promoting the revival of art and cultural activities. Ornamental gardening also represents the artistic and cultural side of life and landscaping our cities, towns and villages should receive greater attention. In fact, it would be a good idea if the Community Projects and National Extension Blocks could take up this aspect of improving the environments in which the people of our villages live. Dr. M.S. Randhawa, your President, has been actively engaged in promoting the cause of ornamental horticulture. His role in landscaping the modern city of Chandigarh is well-known, as also his publications such as the "Flowering Trees in India" and "Beautifying India." I hope that the Society under his leadership will take active interest in the furtherance of ornamental and landscape gardening in the country and formulate proposals for sponsoring a movement for beautifying our cities and towns. This will be a significant contribution of the Horticultural Society of India. I am sure that the Ministry of Agriculture will give due consideration to whatever progressive proposals are put forth by the Horticultural Society of India for the improvement of Horticulture in this and other ways.

I wish the Society a future of an increasingly important role in the development of Horticulture in this country.

Red Spots on Jowar

CONTINUED FROM PAGE 7

fade to tan colour, become papery in consistency and bear an exudate of bacteria in the form of thin crusts.

The causal fungus has been found to be carried over from season to season on *jowar* and *baru* (*Sorghum halepense*) stubble plants, as also on voluntary *jowar* plants during the winter season. The fungus also remains in a viable condition in the *jowar kadbi* (dried fodder) stacked in the open. In addition, the diseased debris left behind and remaining exposed on the surface of the soil after the harvest of the crop is another very important source of infection. Infected seed does not seem to play a very important role in the perpetuation of the disease under conditions obtaining in the Punjab State.

CONTROL MEASURES

Cut the crop as close to the ground as possible. After this, work the field with a furrow-turning plough so as to bury the remnants.

The stumps of the *jowar* crop are often seen to sprout during winter, and continue to do so till the next sowing season of the crop. These stubble plants help the causal fungus to tide over the off-season. Therefore, carefully destroy all stubble plants by burning, or compost them.

Destroy *baru* which is an additional host of the causal fungus of this disease and helps it to tide over the off-season.

Never stock *jowar kadbi* near the fields where the *jowar* crop is to be sown. Stock it inside a compound or under a roof. Whenever the fodder is fed to livestock, the refuse must be composted.

The *bajra* crop is immune to practically all red leaf-spot diseases of *jowar*. A mixture of *jowar* and *bajra* will, therefore, reduce the incidence of the disease, as the *bajra* plants will check the dispersal of spores to a considerable extent, especially when the rows of the two crops alternate with one another. Adopt this practice wherever feasible. Also, during years of severe infection when the *jowar* crop may be seriously damaged, the *bajra* crop grown in mixture with the *jowar* crop, may ensure a reasonably good harvest.

A rotation with a non-susceptible crop, such as maize or *bajra*, considerably reduces the chances of primary infection in the fields. Avoid successive cultivation of *jowar* in the same field.

Jowar varieties *J. No. 29/1* (Sirsa selection) and *Duggi* (Uttar Pradesh) are quite resistant to the disease. They are also very promising as regards grain yield and possess white grains of attractive quality. Their cultivation is recommended, especially in the heavy monsoon areas of Punjab State, like Gurdaspur, Ambala, Hoshiarpur and Karnal districts.

Shell-fishing In A & N Islands

CONTINUED FROM PAGE 11

The recommendations were duly considered by the Administration and incorporated in the fishing rules framed in the year 1939 under the Andaman and Nicobar Islands Fisheries Regulation, 1938. These rules were further amended in the year 1955, because the fishing conditions had completely changed during the years 1939 to 1955.

In the pre-war years, up to 1941, the Japanese shell-fishing companies of Singapore had a complete monopoly of shell-fishing in these waters. They had sea-worthy diesel-engined boats which were capable of going on the high seas, thus making shell collections possible from fairly extensive areas. After the war, it was proposed to organize this industry with our own local resources. For this purpose, the shell beds were divided into the following nine zones.

Cape Price to Mayabunder
Cape Price to Austen Straits
Mayabunder to Long Island
Long Island to Shoal Bay
Shoal Bay to Chiriatapu
Chiriatapu to Port Mouat
Ritchie's Archipelago
Nicobar Central Group
Nicobar Southern Group

FISHERY MANAGEMENT

Shell-fishing licences are granted by the Administration in the month of October for two consecutive years. The period from 1st May to 30th September is treated as the closed season for the fishery, and no one is permitted to lift shells from their beds in this period except the Fisheries Department for scientific purposes. Ordinarily, there is one licencee for each zone, but in exceptional cases, two zones can also be allotted to one person.

Each licencee must possess a power-driven boat not less than 25 feet in length and powered by a 20 H.P. engine. A certificate of sea-worthiness for such a boat is granted by the Engineer and Harbour Master at Port Blair. In addition to the power-driven boat, each licencee is permitted to engage not more than four boats or *sampans* for the collection of shells.

The licence fee for a power boat is Rs. 400, and for each boat or *sampan*, Rupees ten. For the collection of shells, each licencee can employ not more than 20 divers. Proper licences are to be obtained for these divers also and the licence fee as prescribed under the rules is Rs. 20 per head.

A maximum of 25 tons of shells can be collected in a season from each zone. A royalty at the rate of

Rs. 200 per ton is charged by the State Government on these collections. In addition to the above licence fee and the royalty on shells, each licencee has to pay a premium of Rs. 1,000 per season or part thereof.

To check indiscriminate fishing, the State Government has fixed a maximum diameter limit of nine centimetres at the base for *Trochus* shells and 6.36 centimmetres for the operculum for *Turbo*, below which no shells are to be collected. Every collection of shells is inspected by an authorized officer of that zone. For this purpose, the shells are removed from the boats and stacked on the shore. Measurements are taken for determining the percentage of undersized shells in these collections. To protect the fishery, very strict measures have been enforced by the State Government. They are:

(*i*) if the percentage of undersized shells in any collection is found to be more than ten per cent, then the shell-fishing licence is liable to cancellation;

(*ii*) if the number of undersized shells varies between five and ten per cent, the whole catch is liable to be confiscated to Government;

(*iii*) in a catch where the undersized shells do not exceed five per cent, royalty at double the rate (i.e., Rs. 400 per ton) is charged on the undersized shells found in that collection.

FISHING METHODS

After obtaining a shell-fishing licence, each licencee moves to the area allotted to him and locates a suitable camping place for the first fishing season. Then, a quick survey is undertaken to mark the thickly populated shell beds which should be exploited first. When a suitable area has been chosen, a team of five to six divers is left with a *sampan* and fishing implements on a nearby island. About a week's ration is supplied to them.

The motor-boat tows other *sampans* with divers to other fertile beds and leaves them there. Once in a week or at shorter intervals, depending on weather conditions, the motor-boat visits each party in rotation to gather the shells collected by them and to supply ration for another week. When a sufficient quantity of shells has been collected, it is brought for inspection by the authorized officer and then shipped to the mainland for export to foreign countries.

As the shells of *Trochus* and *Turbo* are found on rocky ledges and the great corridors formed by the massive Madreporarian corals up to depths of eight to ten fathoms, it is convenient to make collections during low tides. The divers leave their camps well in time, so as to reach the collection centres when the tide starts receding. They work hard till it is high tide again.

The methods employed are very simple. No diving kit is used by the divers. A pair of cotton knickers and a vest firmly tucked into it, a pair of goggles of plain glass mounted on a wooden frame and tightly tied by rubber bands around the head complete their equipment.

Before putting them on, the goggles are first cleaned with crushed pieces of cuttle-fish "bone" soaked in sea water. The goggles firmly sit over the nose-bridge and fit the orbits, preventing sea water from getting into the eyes, and also enable the diver to see the bottom clearly. Then, a handkerchief or a towel is tied round the head to prevent slipping of the rubber band of the goggles. The divers then jump into the sea, leaving only one man to manage the *sampan*.

The diver swims at the surface of the water, observing the bottom. Whenever a shell is sighted, he goes down and picks it up with a sharp jerk. In this way, he goes on making the collection. He keeps all the shells collected in his vest until he finds them too heavy to swim with; then he gives a signal to the man in the *sampan* with an uplifted arm and the *sampan* draws close to him. He transfers the collected shells to the *sampan*, and again resumes his work.

When the sea is choppy and the divers are not able to see the bottom clearly from the surface, they dive and swim near the bottom. At intervals of a few seconds to a minute, they come up for breath. As the divers keep on moving along the reefs, the boatman manoeuvres the *sampan* in such a way that he is always in the centre of the working team. With the approach of the high tide, they stop diving and return to the camp in the *sampan*.

On reaching the camp, all the shells collected are put in a tub of sea water and kept over a fire for boiling, when the animal dies and is easily extracted from the shell. Then the shells are spread on the ground to dry. At the same time, excessive deposits of algae, etc., from the shells are scraped off with a long, blunt knife resembling a *dah*. Then the shells are packed in gunny bags for shipment.

The industry brought in a revenue of Rs. 44,573.26 and Rs. 45,722.74 in the years 1955-56 and 1956-57, respectively. If the fishery is properly conserved, it will be a permanent source of revenue to the state. As nearly all the shells collected are exported to Germany, Austria, the U.S.A. and Japan, where the prices range from Rs. 5,000 to 6,000 per ton, the industry holds out promise of becoming a good foreign exchange earner.

The Anand Hoe

CONTINUED FROM PAGE 14

members as well as the joints are well-designed. As the design is of a sturdy nature, there is no chance of breaking the implement while at work. All the wearing parts, especially the blades, are prepared from suitable materials to reduce the wear and tear or repairs

and replacements. The blades of the Anand hoe do not need frequent sharpening as in case of blades used in the local hoes. This certainly helps the farmer save money and time and keeps him free from the botheration of getting the blades sharpened off and on during the working season.

The hitching-nail is prepared out of a bolt and nut. It can be housed in any of the four holes drilled at the end of the beam. Due to this facility, the position of the hitching-nail can be altered. Thus, the hoe can be easily hitched to any bullocks.

As pointed out earlier, the blades are slightly curved. In the case of hoes with the usual or straight blades, the operator has to lift the hoe while in operation to scrape off the weeds, etc., that stick to the blade and get collected at the edge. In hoes with curved blades, the cut or uprooted weeds pass off the side on account of the curvature provided. The curved blades thus (*i*) eliminate or reduce frequent lifting of the hoe to clean the blade, (*ii*) provide a sharp edge for cutting the soil throughout the row, which otherwise could not be achieved by straight blades since they get blunt by weeds that get collected at the edge during the hoeing operation and (*iii*) work quite uniformly within the rows.

COST OF MANUFACTURE

Given below is an idea of the materials required and their cost, for constructing a hoe of the Anand type.

Item	*Cost*
	Rs.
Beam of local *babul* wood 2 inches × 1½ inches × 12 feet, duly prepared	5.00
Hitching-hook prepared out of ½ inch dia. R.I. bar-threaded at one end for two inches, with necessary nut and pin	1.00
Handle with grip prepared from local wood	1.25
A pair of clamps for the handle prepared out of M.S. bar of one inch × ¼ inch with four bolts	2.00
Base-plate prepared out of M.S. angle of 1½ inches × 1½ inches × 1/8 inch	2.50
A pair of U-bolts for the above with nuts	1.00
Fork prepared out of one inch × ¼ inch M.S. bar with necessary holes, etc.	2.50
A pair of prongs prepared out of two inches × ¼ inch M.S. bars	4.25
Assembly with colour, etc.	1.00
Total	20.50
Blades for the above-mentioned unit prepared out of 2 inches × ¼ inch flats	
9 inches working length	2.25
12 inches working length	2.75
15 inches working length	3.25
18 inches working length	3.75
	12.00
Grand total	32.50

Bird Guano for Crops

CONTINUED FROM PAGE 18

This compost serves as a good manure for such crops and no other manure is usually applied. It is amazing that every year hundreds of cartloads of compost are collected from the tank bed from April to June and the farmers even carry it in baskets on their heads. But they are not allowed to dig deep at the middle of the tank lest they should uproot the trees on which the birds nest.

Thus all the lands of the village directly or indirectly profit by the use of bird guano from this sanctuary, and the soil fertility of the surrounding lands is at least maintained, if not improved.

However, though bird guano—which is a phosphatic manure—is by itself evoking good yield-responses from paddy it is worth-while combining it with some nitrogenous organic manure, green manure or oilcake, for an increased yield. But so far as the compost from the tank bed is concerned, it is self-sufficient in nitrogenous and phosphatic contents.

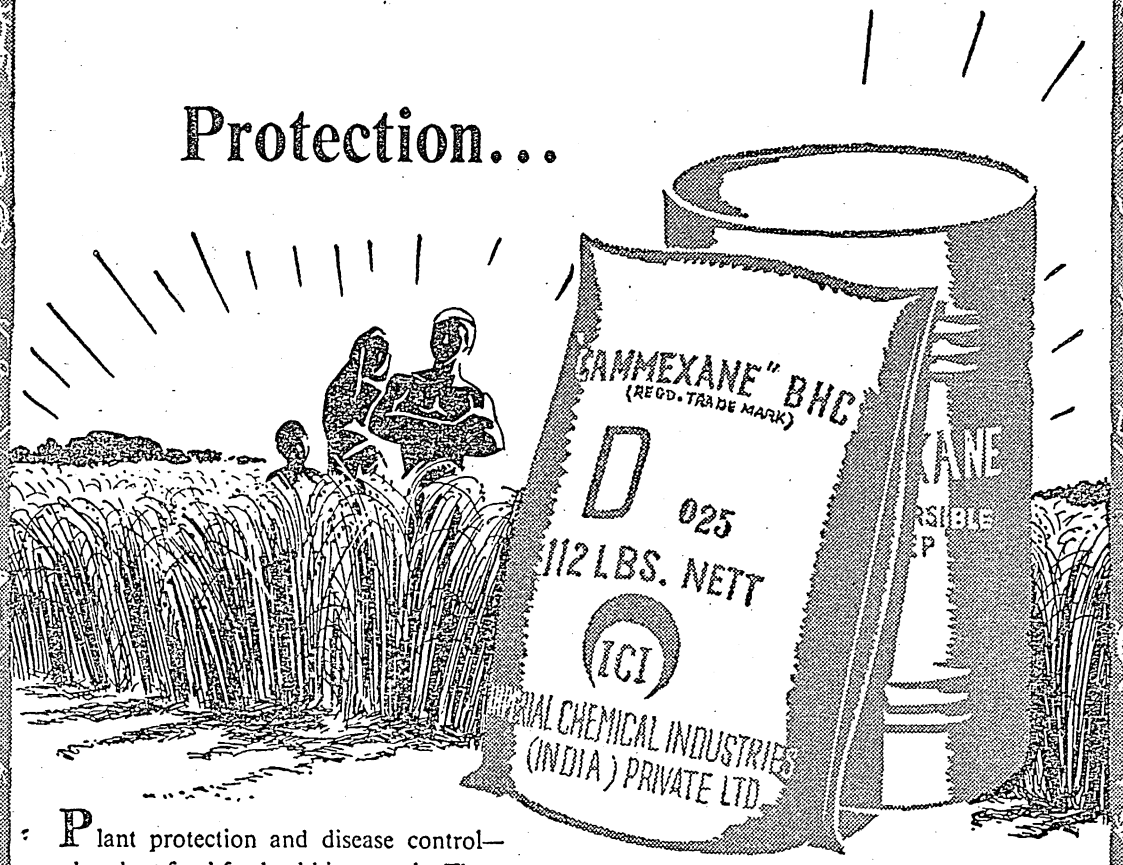
The Vedanthangal heronry has recently been declared a sanctuary by the Madras and the Indian Wild Life Boards, and the Government of Madras has more recently introduced a law prohibiting the shooting of these birds (13 specified birds of the sanctuary) anywhere within a radius of 20 miles from the sanctuary. The contemplated measures by the Madras Government to promote large numbers of birds for a longer stay in the sanctuary will not only serve aesthetic interests of bird love and wild-life preservation, but also the economic interests of villagers round about. Some such measures involve a larger extent of water in the tank by some more feeder or supply channels from the nearby surplus tanks, additional *Barringtonia* trees for increasing the nesting sites for birds and, above all, a greater privacy and freedom for the birds in that area through less interference at the sanctuary by the stream of visitors, photographers and bird-watchers. It could also be experimented to grow such suitable trees in the midst of all the larger irrigation tanks and lakes of India to try and attract large breeding water-birds.

CONTINUED FROM PAGE 32

5. hatch only such eggs in your incubator as are from flocks known to be free of this disease, and disinfect your incubator by formalin fumigation periodically;
6. seek advice from your Poultry Disease Investigation Officer in all such matters.

The Pullorum antigen is available from the Biological Division of the Indian Veterinary Research Institute, Izatnagar. The price for 200 doses or a phial of ten c.c. is Rupees five. The blood-testing, however, should be done by a trained veterinarian only.

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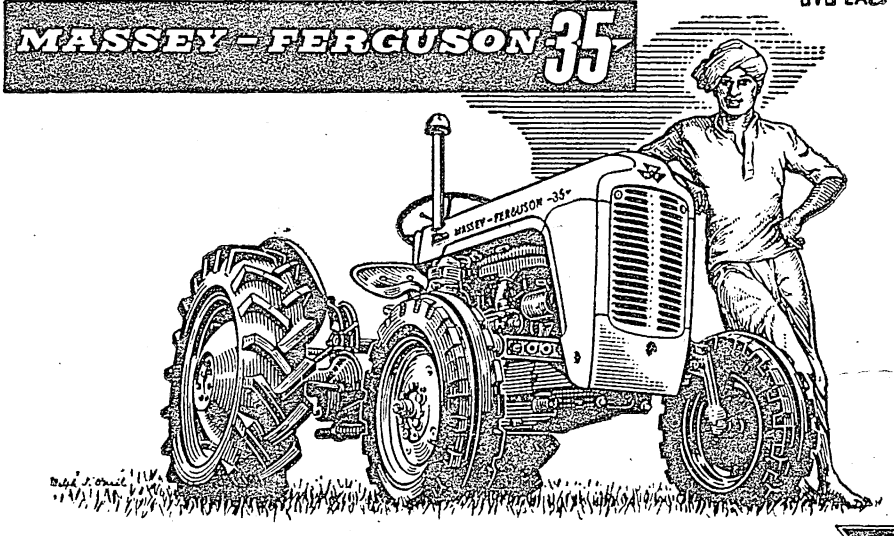
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- **Give the crop attention whilst it grows,**
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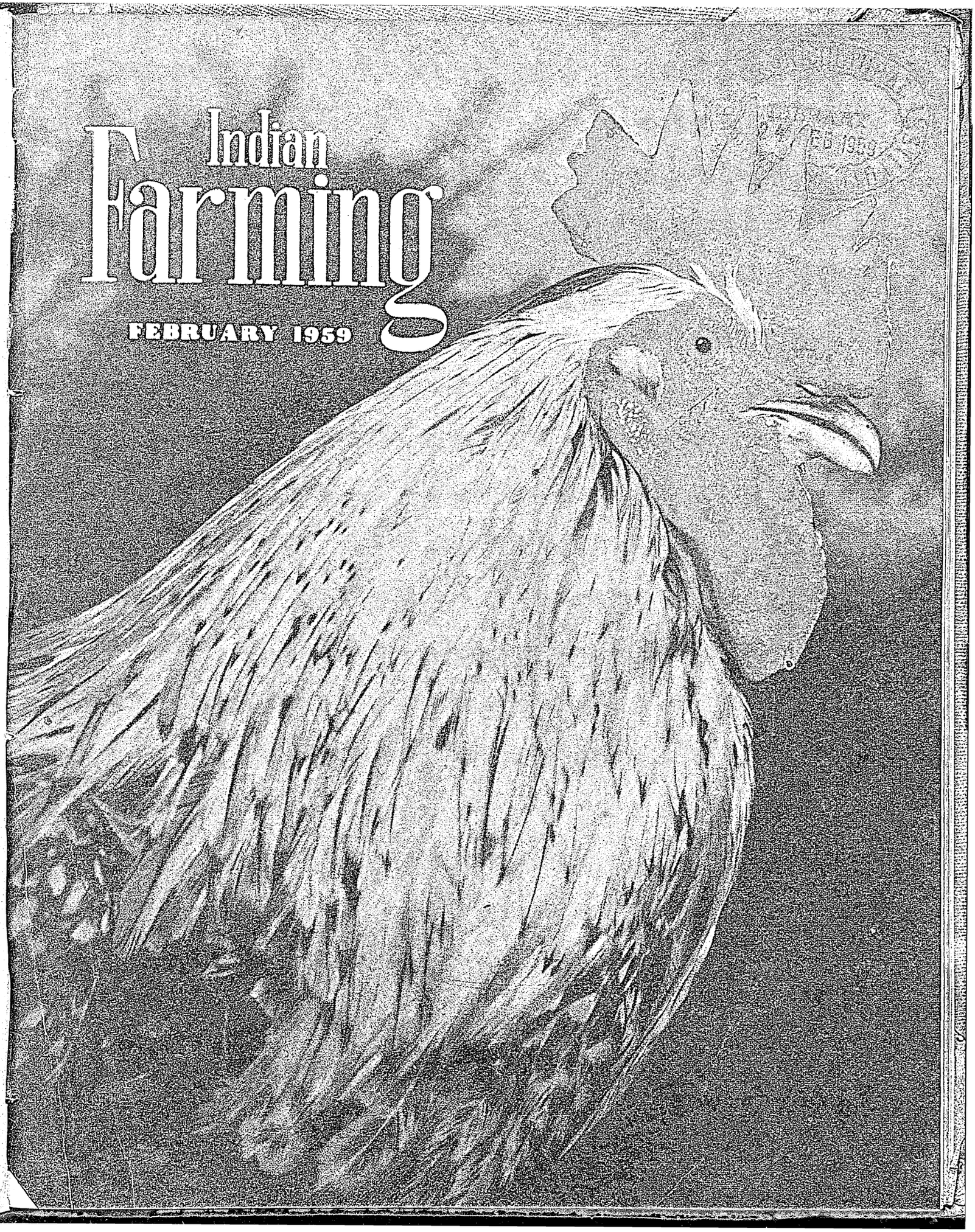
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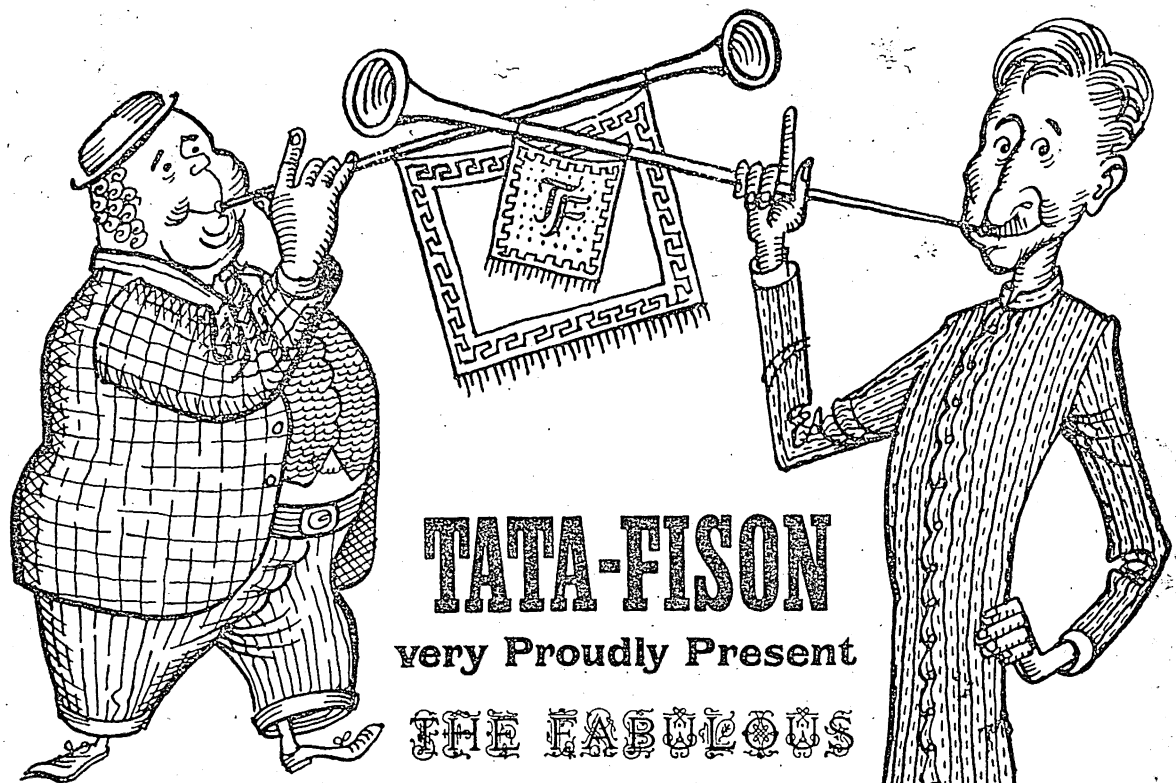
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OUR COVER



As promising as the White Leghorn for commercial egg production is the Brown Leghorn which has been recently introduced into India. With its attractive plumage, especially of the males, the breed is bound to gain popularity sooner or later

Photo by Mrs. K. Vaid

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editor's page

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CARE WITH CHEMICALS

MORE and more farmers are now using chemical pesticides and fungicides to get over their crop pest and disease troubles. The method does not call for much skill or financial outlay, the results achieved are quick. However, as most of the chemicals today in use are poisonous, some of them very deadly, farmers would do well to observe certain simple precautions while handling them.

It would be wise to buy only recognized, genuine packages. The concentrated product should not be transferred into other containers. It should always be stored in a locked cupboard away from edibles and fodder, and out of the reach of children and domestic pets. The accompanying instructions should be strictly followed. Only prescribed dosages should be used, and *only* for the purposes recommended.

In most cases, pesticides have to be used with certain equipments for spraying, dusting, etc. An instrument requiring sucking by mouth to draw the concentrated liquid should never be used. Clogged nozzles should not be blown into by mouth but cleaned with a thin wire. Leaky equipment should be discarded.

A rod or stick, and not the hands, should be used to mix the spray; in fact, rubber gloves should be worn. In case bare hands get into contact with the spray wash or the concentrated chemical, immediate washing with water and soap is necessary.

The operator should not smoke, eat, chew or drink while mixing or spraying. The working clothes should always be kept clean. It is better to have a wash and change of clothes after spraying.

If workers are to be employed to carry out the spraying work, only adult and healthy workers should be engaged, and *never* children or persons suffering from sores and other open wounds. Spraying should not be done at a stretch the whole day: it should be started in the morning, given up during the hot hours of the day and again resumed late in the afternoon. Spraying should be done in such a way that it is not against the wind and the operator does not get the spray mist or dust drift back on him.

The appliances should be cleaned thoroughly after the work is over. A signboard warning people should be fixed beside the field sprayed or dusted. In case of uneasiness while working, such as vomiting sensation, intestinal cramps, giddiness, etc., medical aid should be sought at once.

YOUR QUESTIONS

and

SUGGESTIONS

are

WELCOME

Address these to The Editor, "Indian Farming," I.C.A.R., Queen Victoria Road, New Delhi-2.

Love and Resolve Raise Best Khillari Herd

by

V. G. Patil-Kulkarni



"Give them love and see how they grow," says Khandve



Khandve is a successful farmer, too. He posed for me beside his bumper sugarcane crop. Left is his eldest son

WAY back in 1940, Shri Shankar Vithal Khandve of village Mahud in Sholapur district of Bombay State set his mind upon raising an outstanding herd of the Khillari breed, bought a cow and got her covered by the local pedigree bull. The idea has not proved to be just a fond hope. Today, not only does he own 40 fine specimens of the breed—ten cows, 22 heifers, five bulls and three bullocks, but was also the proud recipient of the First Prize for his "Best Khillari Herd" at the All-India Cattle Show held in New Delhi in March last year.

"The award of the prize did thrill me all right, but I've never considered it an end in itself," said Khandve, when I met him at his farm cottage recently. "To be honest to the honour given me, since then I have tried to bring my work on more scientific lines," he added. He informed me that he was now paying attention to his record-keeping; obviously, he meant milk-yield record, pedigree record, sale record, etc.

Traditional sentimental attachment to *gomata* and a constant eye on profits he expected by exporting his

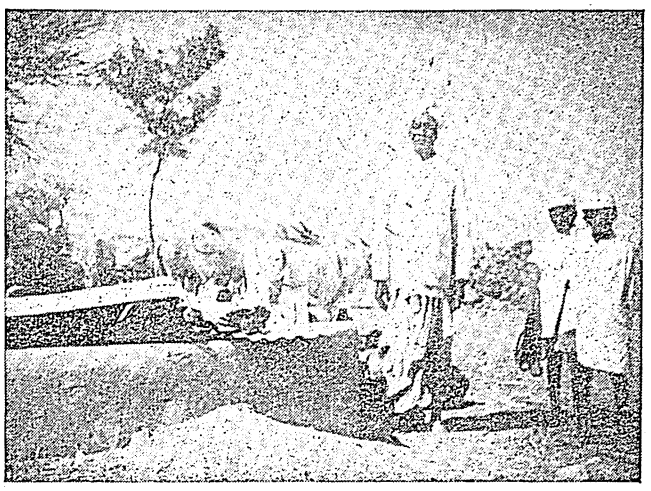
animals to countries like Ceylon and Brazil where there is a heavy demand for this sturdy breed, are what brought success to Khandve. For, whereas the first made him bestow all his love and care on the animals, the second pushed him through the hard struggle to live up to his determination in a tract where drought and famine are frequent and fodder always scarce.

NEAR-PURE BREED

Soon Khandve noticed that a number of his calves, heifers and bulls had a health and looks that distinguished them from the other animals in the village. Immediately, with advice from the Animal Husbandry Department, he took to breeding by outcrossing, and the progeny he got ultimately was a near-pure Khillari breed.

Though it is an established fact that Khillari animals are the most economic to keep and would thrive on just roughage, Khandve is not a man to take any chances. He gives each of his milch cows two pounds of groundnut cake a day mixed with an equal quantity of *matki*, wheat or gram husk. Each animal must receive ten to 15 pounds of roughage at the byre in addition to grazing. Of the 60 acres of land that Khandve possesses, 15 are reserved entirely for the grazing of animals. In summer, when the fodder problem becomes very acute, his animals get silage prepared from *jowar kadbi*, *makka*, etc.

Khandve always takes full advantage of the free services rendered by the local Veterinary Dispensary.

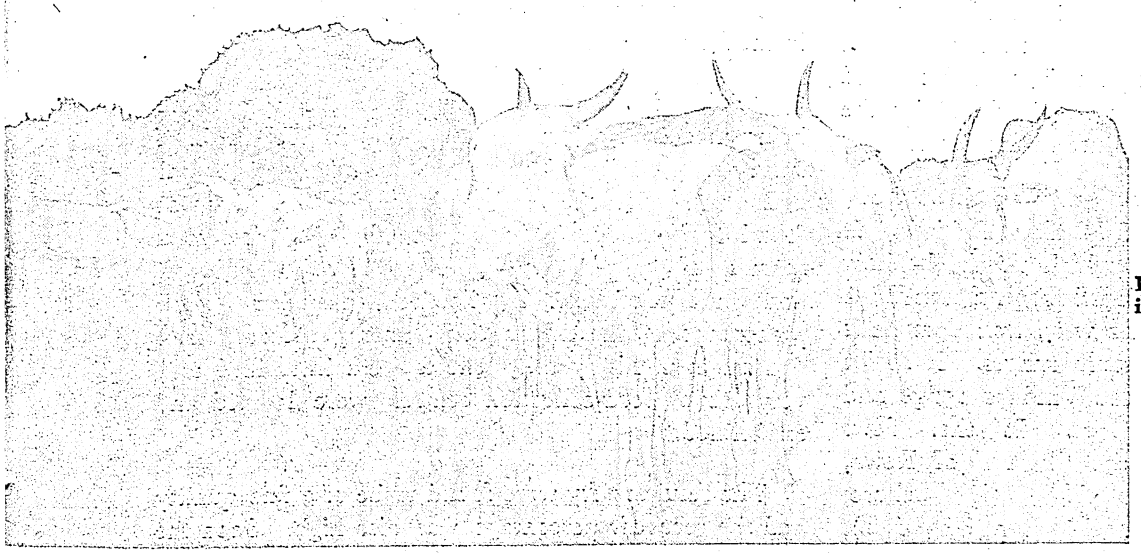


A proud possession of Khandve is this well-built silo

He regularly gets his herd protected against seasonal and regional cattle pests. Many of his fellow breeders are now following his example.

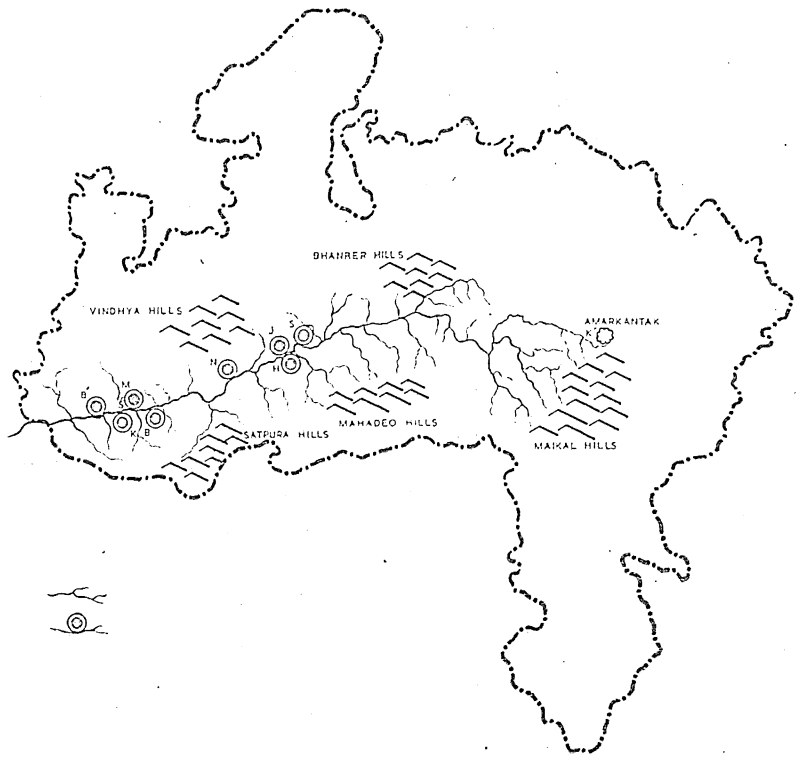
FULL OF PLANS

Popularly known as "master" in the area, Khandve is full of plans for the future. "I want to construct a footbath for my animals because the foot and mouth disease is sometimes a big nuisance to them," he told me. The other thing about which he appeared quite keen was the installation of a cow-dung gas plant. That he is also a wide-awake farmer was revealed when he showed me the cement pipes he had bought to reorientate his irrigation system and a blueprint for constructing bunds to check soil erosion.



Khandve's 40-strong herd in paddock

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The Narmada and its 27 tributaries
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For Its Fish Seed, M.P. Can Now Depend on Narmada

by

G. P. Dubey
Fisheries Development Officer
Rewa

INVESTIGATIONS over the past few years have revealed the Narmada river in Madhya Pradesh as an important source of adult table fish as well as seed of the major carps. The river also abounds in Mahseer, the mighty game-fish of the Indian waters, and its seed. What is now required is a judicious and extensive exploitation of the potential offered by the river for the benefit of pond culture in the State.

The Narmada originates at Amarkantak at 3,500 feet in the Rewa Division of Madhya Pradesh. It starts as an underspring, over which stands the holy shrine of Shivalinga. After going through a man-made stone tank it turns towards the west, and then flows between the Vindhya and Satpura ranges. It drains the entire southern slopes of the Vindhya range and northern slopes of the Satpuras. It then flows through Madhya Pradesh in the districts of Rewa, Jabalpur, Narisinghpur, Hoshangabad, Raisen, Sehore, west Nimar (Khargone) and east Nimar (Khandwa), for about 800 miles, presenting a few falls, the most famous being Kapil Dhara and Sahastra Dhara, and many a rapid. It then passes into Bombay State, ultimately finding its eternal home in the Arabian Sea in the form of an estuary near Broach.

As all the fish seed requirements of the State were being met from Calcutta and Patna, in 1950, a brief survey was conducted to assess the fishery potential of the Narmada. Besides the minor fish, the river was found to have plentiful supplies of the commercial species of carps, catfish, Murrel and Mahseer, and some experimental collections showed a good percentage of the major carps among the recovered fry. Encouraged by this, efforts were intensified and very soon seed-collection centres were located and established.

The resultant fry were found to be of a fine quality and the recovery percentage was also high. Soon the

seed imports were totally stopped, saving a good bit of the State exchequer. In all, eight centres have so far been developed, and sometimes the daily yield from the centres at Nemawar, Shahganj and Khalghat goes up to 90 to 95 per cent carp seed.

The quantity and quality of the seed depends on the rainfall and flood. Maximum seed is available at the time of the second flood in July, and even the third flood in August also brings in good quality seed. The regular collection season begins in early July and lasts till the middle of September. The overall percentage of the major carps in the seed works out at 20 to 25 per cent of the total collection.

BEST COLLECTIONS

The best collections are made from shallow banks one or two miles downstream opposite to the confluence of a tributary with the main river. This is because the major carps breed in the upper reaches of the tributaries and the spawn is carried down into the river by the water current. Shallow sandy beaches formed opposite to the bends of the river are also fairly good collection sites.

The eight collection centres so far established are being regularly exploited. During 1958, nearly 60 lakh spawn could be collected and 15 lakh fry and fingerlings are expected to be raised out of them. Efforts are still being continued to localize the best collection spots and determine the best collection period so that good quality seed at low cost can be collected.

During the peak periods, as much a as 1,500 c.c. bowlful of spawn can be collected in four to five minutes. The spawn collection is done with *konamari* nets made of muslin cloth and fixed at regular alternate rows facing the water flow. The spawn is kept in small nursery pits for a fortnight or so. Such nursery pits are provided at all the centres.

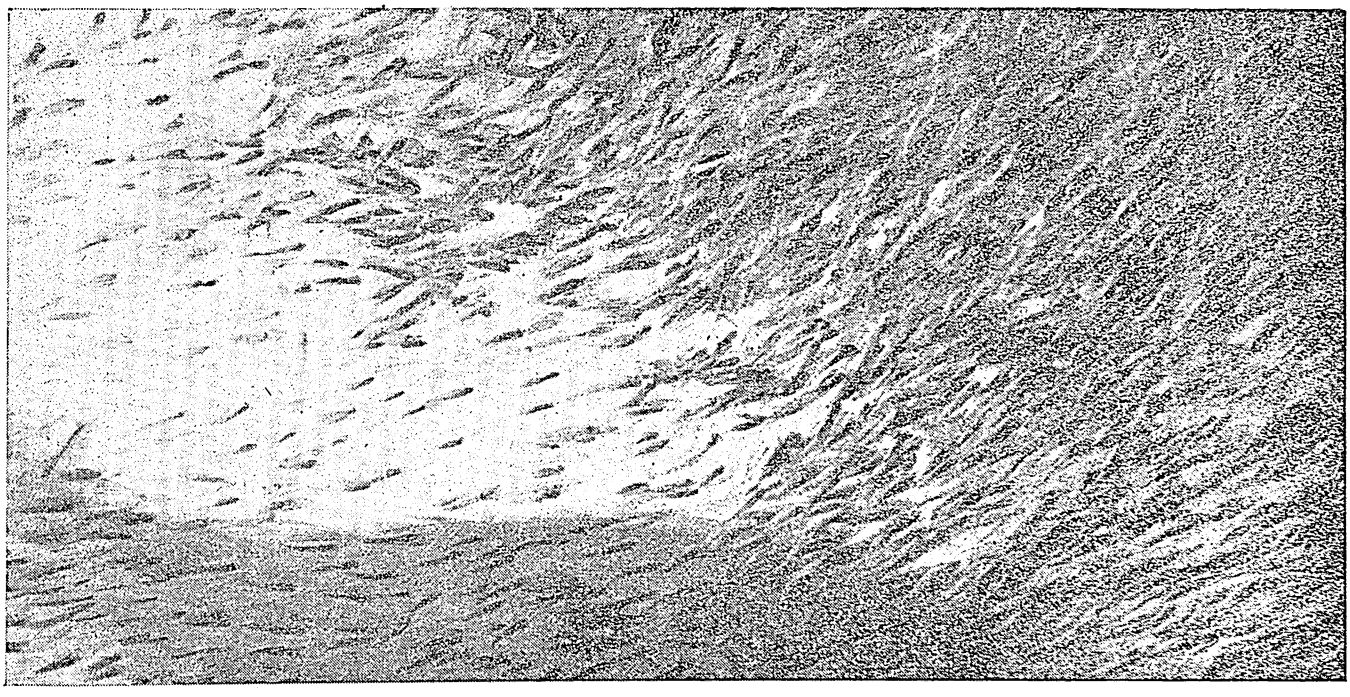
In addition to being that of *Catla catla*, *Labeo fimbriatus*, *Labeo calbasu* and *Cirrhina mrigala* the resultant fry also contains small quantities of the minor carps. The unwanted varieties are sorted out and the carp seed is either put in rearing tanks or directly stocked in stocking tanks. The surplus is transported to seed-deficit areas in plastic bags under oxygen pressure.

During the First Plan period, a total of 7½ lakhs of fry and fingerlings was recovered at the Narmada centres in the Indore Division. Subsequently, the number increased to 8½ lakhs in 1956-57, 11 lakhs in 1957-58 and 15 lakhs in 1958-59 from all the above centres.

VALUABLE VARIETY

It is interesting to note that *Labeo rohita* had so far been absent in the Narmada, but as a result of the release of stock-fish from some tanks in Indore and Jabalpur Divisions, this valuable variety has also been introduced. The catches of adult Rohu at Hoshangabad and Onkareshwar and also at Jabalpur show that the fish has acclimatized and is growing well. Already small quantities of its seed are found among the spawn collections, and in a few more years large quantities of

Mahseer fry recovered from the Narmada



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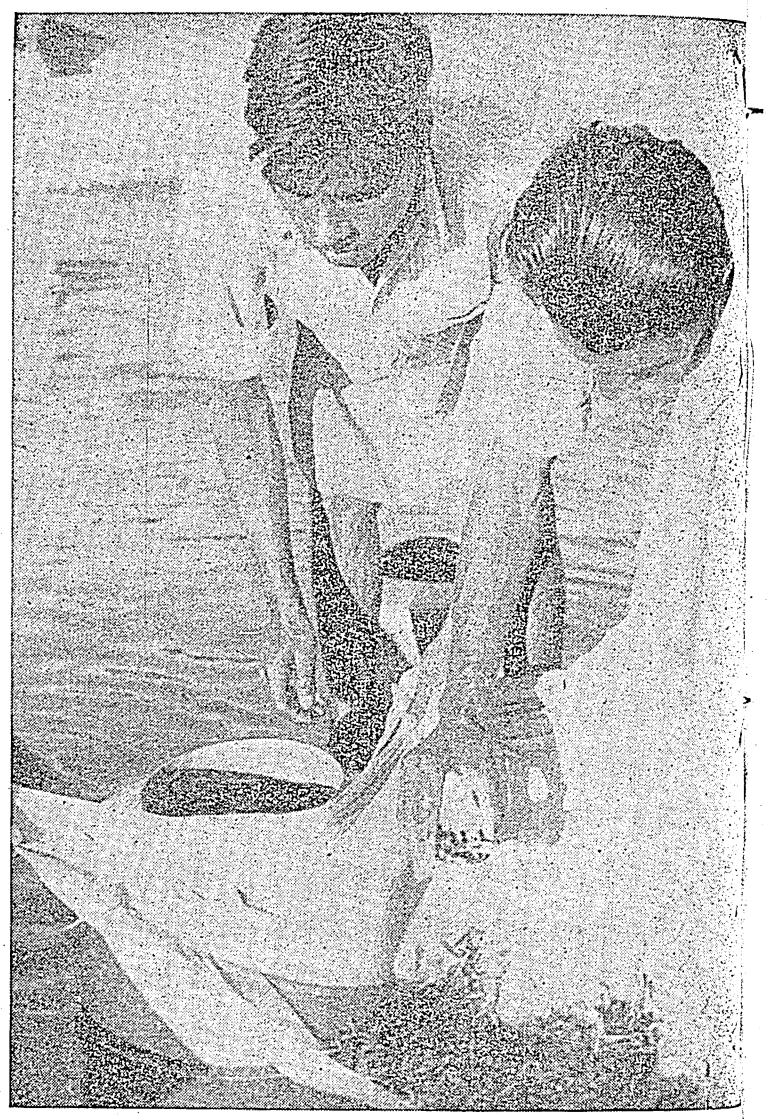
PHARMACEUTICALS DIVISION

Wilmslow, Cheshire, England

IGV-445

it are anticipated. The Narmada Rohu *Labeo fimbriatus* occurs in good quantities, so also its seed. It has been found to attain a size of ten to 12 pounds in three to four years in stocking tanks.

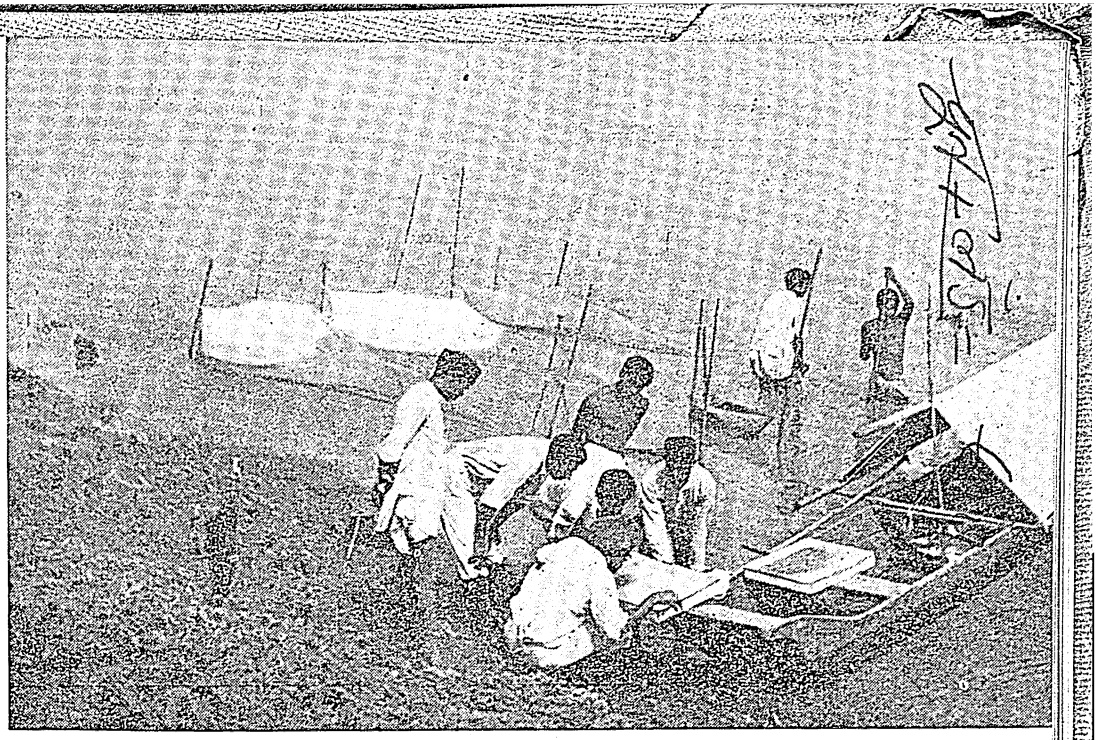
At the close of the carp spawn collection season, which is quite a long one, the muddy river clears up, and this is the time for Mahseer to breed. The breeding takes place by the end of September, and is over by the middle of October. The September breeding is the third breeding, as Mahseer is known to breed in January and June-July also.



Counting the catch

The breeding is more intense during the September-October period. On the sunny days of October and November, hordes of young ½ to 1½-inch Mahseer fry are seen playing briskly in the shallow rapids formed by small pebbles. These tiny, active fry can be easily collected with a rectangular piece of mesh cloth.

LIBRARY



Konamari nets have been set to trap the fry

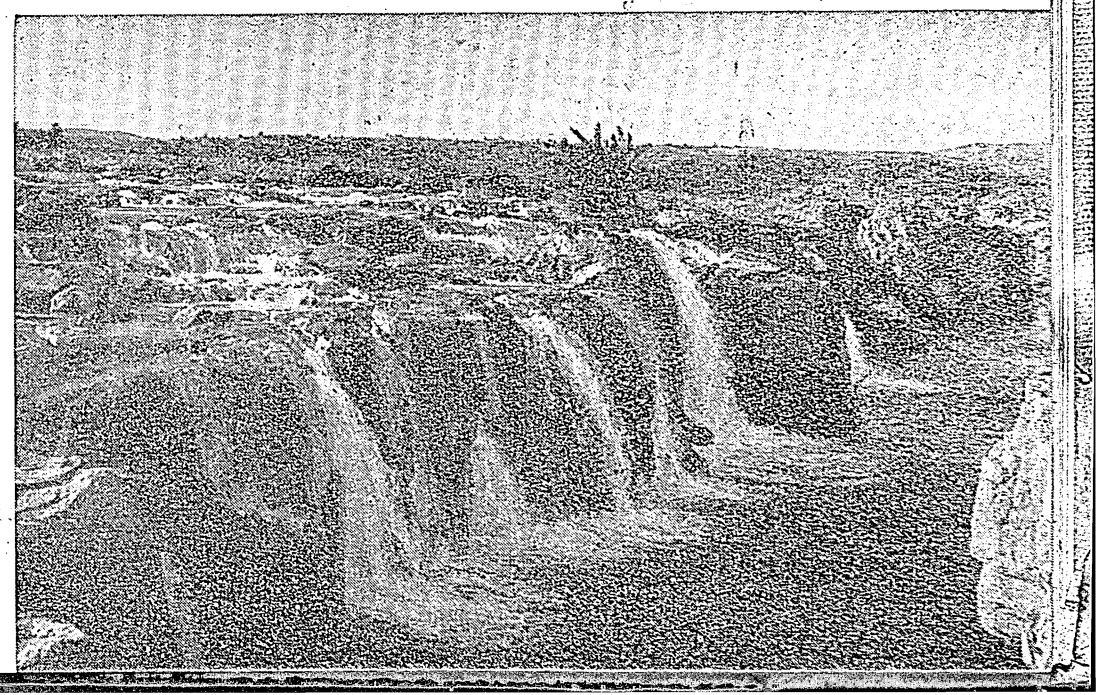
An improved type of net with a central cone-like bag and laterally extended wings is also used, as it covers a wider area and gives better results. Some leaves and twigs are tied to a rope and this contraption, called the "scare-line," is moved across the water. Two men stretch it from corner to corner and drag it in a semi-circular fashion, shaking the rope every now and then. The tiny fry are thus driven in front of the net which is also operated simultaneously.

THE DAY'S HAUL

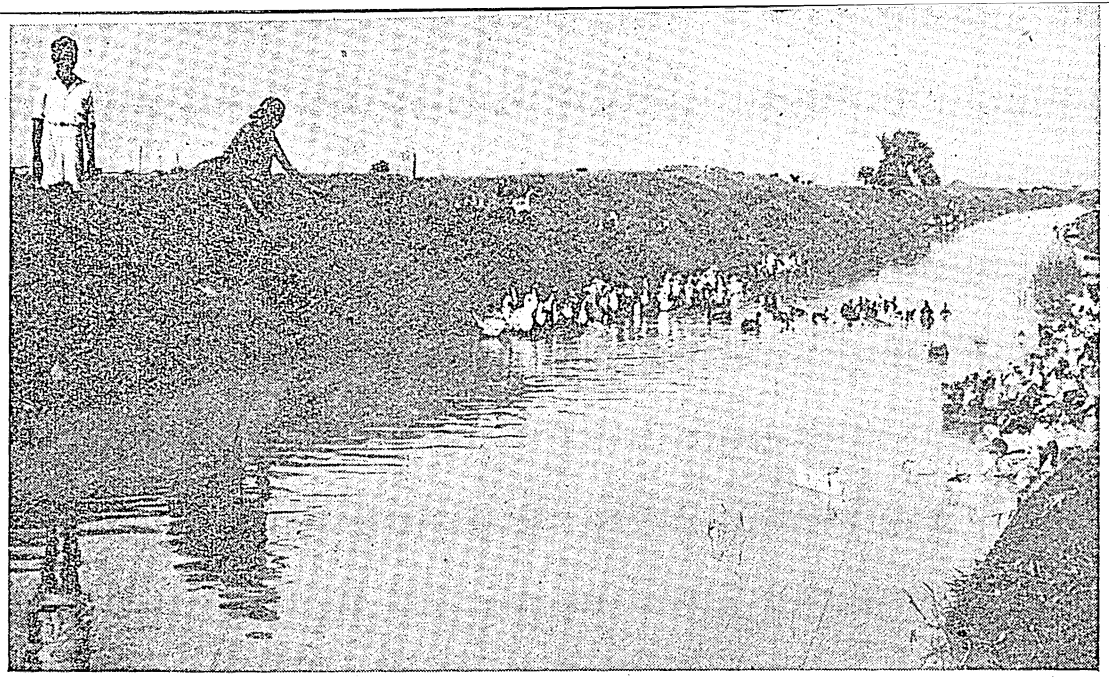
A full day's haul, by working between 11 a.m. and 4 p.m., yields about 10,000 to 15,000 fry. The Mahseer fry are very hardy and can stand the stress of long-distance transport. The weaklings are weeded out by conditioning in mesh *happas* kept in a shallow current. The work of fry collection is done through private parties of fishermen and the seed thus procured costs three to five rupees for a thousand.

This natural treasure of Madhya Pradesh has been well utilized and pond culture of Mahseer is also being advocated along with that of the major carps. Mahseer grows to six to eight pounds in $2\frac{1}{2}$ to three years, and this is very satisfactory. During 1956-57, over two lakhs and during 1957-58, five lakhs of fry of Mahseer were collected and stocked in the tanks of Madhya Pradesh.

The seed potential of the Narmada is very high and it has already fully met the seed requirements of Indore and Bhopal divisions. In addition, seed was also supplied to the Mahakoshal region in 1958-59. It is hoped that in the next few years it would be possible to meet the entire seed requirements of the State, and probably of some of the neighbouring states as well.



The picturesque Sahastra Dhara fall at Maheswar in W. Nimar district



Irrigation channels provide an ideal roam for the birds

Towards More Duck Eggs, Better Returns to Producer

by

P. Seshadri Sarma

and

K. Janardana Rao

Andhra Pradesh Department of Agriculture, Hyderabad-Dn.

THE delta districts of East Godavari, West Godavari, Krishna, Guntur and Nellore of Andhra Pradesh produce annually about 225 lakhs of duck eggs, valued at nearly Rs. 18.75 lakhs. Of these, only ten per cent are consumed within the State, leaving a large surplus for export, mostly to Calcutta. These delta districts of the State have over 30 lakhs of acres under paddy with assured irrigation, and the swamps provide ample natural feed for the ducks in the form of shed grain in paddy fields, snails and insects and larvae. With proper measures, the present production of duck eggs in this tract can be increased considerably, and the need to import over twelve crores of eggs annually, valued at over one crore of rupees, from East Pakistan done away with.

Except for a few individuals engaged in duck breeding in the *kolleru* area of West Godavari district, there are no regular duck breeders in this tract. The ducklings for rearing are generally obtained from Conjeevaram, Arkonam, Wallajah Road, etc., of Madras State at Rs. 250 per 100 birds, including transport charges of Rs. 25 on the average.

To keep down the cost of maintenance and to increase the margin of profit, the birds are allowed to roam about freely and fetch their own feed. Weather conditions and the cropping pattern in these districts necessitate the shifting of birds from place to place according to the availability of the feed. When long distances are involved, the birds are transported in lorries in specially designed cages. Thus the flocks will be found roaming about in the wet land areas of the Godavari delta and Krishna district from November to the middle of February, feeding on the shed grain, insects, larvae, etc., in the paddy-growing areas of Nellore district from February to June, and in the wet land area of Guntur district from July to October. But so far as the *kolleru* area is concerned, the continuous swampy conditions there make the rearing of these birds possible from November to the end of June.

The birds are maintained in flocks of 300 to 400, which forms a unit. Each flock will have eight to ten per cent male birds, also known as drakes. Though for the production of table eggs it is not necessary to maintain the drakes, the duck rearers consider them



And, harvested paddy fields enough shed grain for food

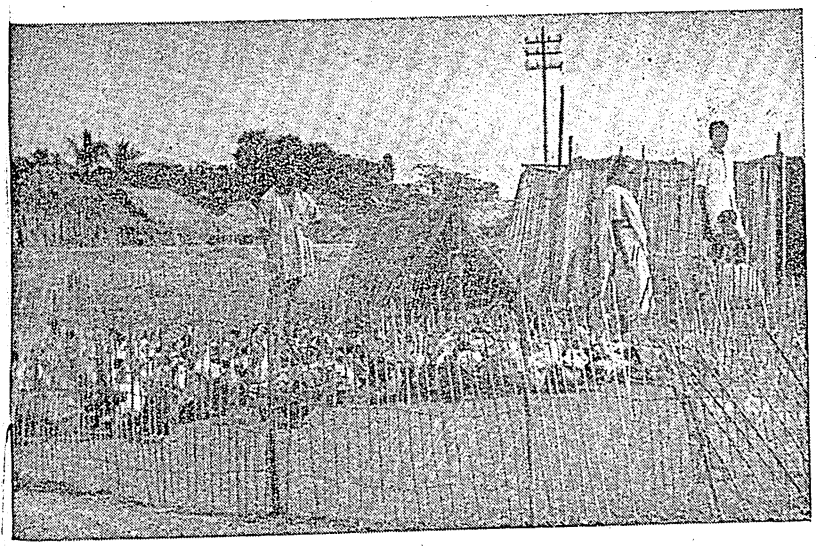
necessary for the health of the ducks and for increased egg production.

On the average, a single duck lays about 120 eggs in a year in the first two years of laying. The egg yield goes down to 80 in the fifth or sixth year. With proper feeding and management, a good layer can be expected to yield 150 eggs in a year.

The birds return to the enclosures at nightfall. Each enclosure accommodates one unit. The enclosures are provided with a thick layer of straw to keep the birds warm, to serve as a bedding for them and to prevent the eggs from getting soiled.

Ducks lay eggs at about 2 a.m. The flock owners collect the eggs very early in the morning, long before sunrise. The collected eggs are kept in a cool place before they are taken to the assembling centres for sale.

In enclosures such as this the birds are housed for the night



The strong pungent smell of the duck egg stands in the way of its larger demand from within the State. But in West Bengal, where there is a sentimental objection to consumption of hen eggs, duck eggs are in great demand. This accounts for the export of large quantities of duck eggs to the Calcutta market.

ASSEMBLING CENTRES

The assembling centres for duck eggs are Anaparthi, Rajahmundry and Medapadu in East Godavari district, Akiveedu, Bhimavaram, Tadepalligudem, Eluru, Veeravasaram and Palacole in West Godavari district, Kaikalur in Krishna district, Repalle and Tenali, etc., in Guntur district and Nellore. Tadepalligudem and Rajahmundry being situated in the heart of the producing area and also being on the main railway line have become important exporting centres.

Egg baskets are transported to the assembling centres and from there to the railway stations on buses.

Maintaining of duck flocks is mostly taken up as a wholetime job, only about ten per cent of flock owners being cultivators. The assembling merchants (who are also exporters) at the above centres purchase the eggs from the producers, mostly at their own premises. But when the supply is short, they send their agents to the villages. These exporters keep in constant touch with the commission merchants who keep them informed about the prices prevailing in the Calcutta market. The prices are quoted per hundred eggs, irrespective of their size.

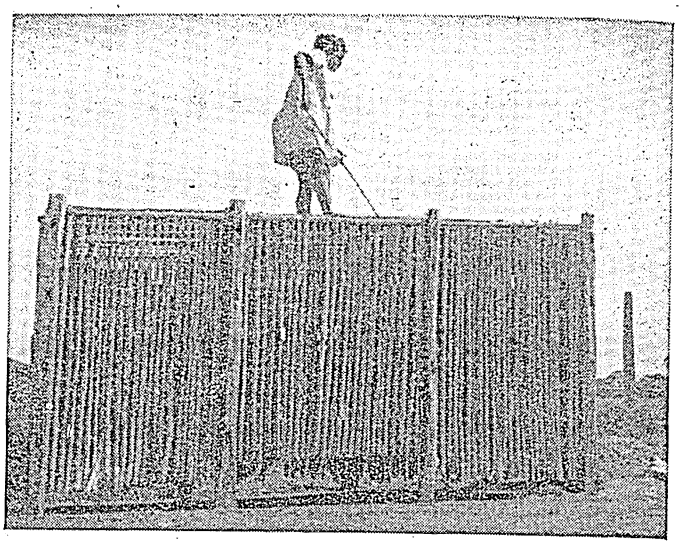
FINANCIAL ASSISTANCE

About half of the egg producers take financial assistance from the assembling merchants by way of cash advances. They are then obliged to sell their produce to them at rates lower by 25 to 50 nP than the ruling rates, depending upon the period of advance. The

period of advance generally ranges from three to six months.

The eggs purchased by the merchants are packed in baskets, using sufficient clean paddy straw as packing. Each basket holds 300 eggs and weighs about 25 seers. Necessary precautions in packing are taken to ensure safe transport by train. Ninety per cent of the stocks are sent on consignment basis to the Calcutta market. About ten per cent are purchased by a few Calcutta merchants operating at Kaikalur, Akividu and Bhimavaram on cash payment.

The baskets received at the other end are sold by commission merchants to retailers and large establishments like hotels. The baskets are mostly sold without opening. Only when damage in a basket is suspected that it is opened and sold. The sale is by negotiation. The commission merchant sends the money due to the exporter immediately after sale, after deducting his commission and other expenses. Ordinarily, money is received within a week of the date of despatch. In the retail trade, the eggs are cleaned and sorted for eliminating the stale and broken ones.



A specially designed cage for transporting birds in lorries

Marketing costs vary with the manner in which the consignment is booked to Calcutta, i.e., whether it is sent by express or passenger train, or despatched in a direct train or sent to some intermediary station and thence rebooked to Calcutta. The assembling merchants normally get a profit of about nine per cent. Consignments booked by direct train (express) from Tadepalligudem fetch higher prices,

PROBLEMS OF INDUSTRY

Production: Duck-rearing has become a specialized type of farming in this tract, but breeding, feeding and management of these birds is not on scientific lines. The birds do not belong to any specific breed. Therefore, the immediate need is for a research station for evolving a breed of high-laying capacity suitable for the tract, and for finding out better methods of duck feeding and management.

Quality: Fertile eggs do not keep in good condition for long periods. The transport from the production centres to the consuming market takes a long time and the chances of the quality going down, and even spoilage, are high, more so during the summer months. Production of infertile eggs for export, therefore, should be encouraged.

Dirty and stained eggs fetch lower prices. Since washing hastens spoilage, production of clean eggs by providing abundant floor space to the birds during the nights and spreading sufficient litter on the floors of the enclosures, needs to be stressed.

Grading: At present, the eggs are sold without any kind of grading. The prevailing prices in the Calcutta market are quoted irrespective of the size of

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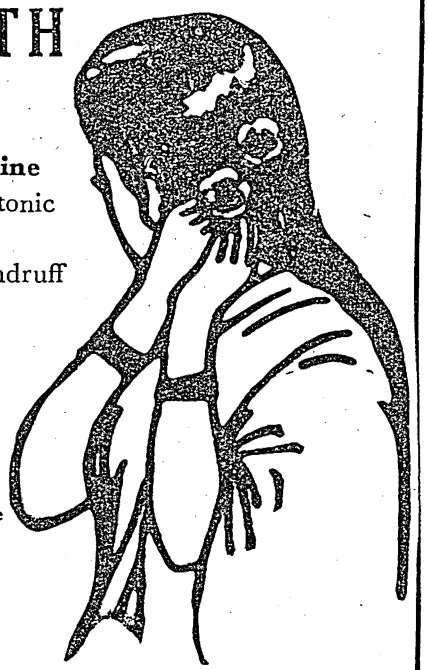
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the eggs. But the retailer in Calcutta sorts the eggs before selling.

More than 70 per cent of the eggs received in bulk at the different assembling centres in this area fall under the first two grades, "Extra large' and 'Large," as per Agmark specifications. The rest fall under the third grade, "Medium," and generally very few go under the last grade, "Small." Thus, if the producer gets his eggs graded before selling he will get a higher return. Compulsory grading of eggs will have to be enforced so far as the export trade is concerned.

Transport: Apart from producing the right kind of eggs, it is highly necessary that they are so handled as to make them available to the consumer with the least possible loss of quality.

Till recently, unrestricted direct booking of duck eggs from all the rail-heads in Andhra Pradesh was



Egg baskets securely held on bus-tops for transport

available. But at present the Southern Railway has restricted the direct booking and only limited quantities are booked direct to Howrah on a quota basis from each station. The exporters are moving the remaining stocks by booking to Waltair in the first instance and then rebooking to Howrah. This is entailing an appreciable amount of additional expenditure and also resulting in abnormal delays. Consignments despatched by express train fetch 50 nP to a rupee more per 100 eggs in the Calcutta market, as these reach there comparatively fresh.

There are no special arrangements in the railway brake vans to accommodate the egg baskets. These are piled one upon the other in a crowded manner, the topmost one almost touching the ceiling of the van. It is highly necessary that an E.V.P. (Empty Ventilated Parcel) waggon should be provided for the transport of eggs. This waggon should be attached to the Hyderabad-Howrah Express daily at the Tadepaligudem railway station during the peak season (November to February). The waggon should be provided with shelves to keep the egg baskets. A refrigerated waggon would solve the problem fully.

Freight rates: About 12 per cent of the price realized in the Calcutta market is spent towards the freight charges alone. The consignments are being charged at half parcel rates at present. As the eggs are as much perishable as fruits, the concession of one-fourth parcel freight rate allowed to fruits may be extended to eggs also.

Movement of birds by train: To facilitate easy movement of ducks from place to place at minimum cost, priority should be given to booking of baskets of ducks by passenger trains.

Storage facilities: Cold storage plants may be established for storing duck eggs. Cold storage of this product and regulated sales will make it free from the effects of seasonal gluts in the market, restrictions imposed in booking by the railway and high temperatures during summer.

Better marketing: To improve the lot of the producers, it is necessary that co-operatives enter into the field of financing the producers and in assembling and marketing the eggs. The co-operatives may also aid the producers in the transport of birds.



Grading of duck eggs would bring the producer more profit



The filling has reached the ground level

SILO THAT SURPLUS FODDER

by

K. Kandaswamy

and

N. Ramaswamy

Livestock Research Station
Hosur

A GOOD substitute for green fodder during the difficult days of summer is silage. Silage is nothing but surplus green fodder, when it is available in plenty during the months of October and November, saved in silos for future use. If preserved in the proper way, unlike hay, silage does not lose in quality even after five years, it has been seen at the Hosur Cattle Farm. Most fodders and all grasses and surplus pasture, except legumes like lucerne, berseem and sannhemp, can be made into good silage.

Silage-making has many advantages over hay preparation. The succulent condition of the green fodder is maintained, and the product gets the smell of wood-apple which is liked by animals when they get used to it. The crop can be harvested at an early stage of maturity, there is no need to wait for ideal weather, and there are no curing problems. The cost of preparing silage is low.

The process of siloing or ensiling, as it is called, has developed greatly in countries where the weather may not always be kind for the making of hay, or where large quantities of green succulent feeds are required for the cattle during winter. In those countries, different types of silage are formed in constructed towers, but for our conditions ordinary pit-silos are quite suitable.

DIGGING PITS

Pits may be dug on a high-lying portion of land, so that there is no seepage into them. The size of the pit would depend on the fodder available for ensiling. It may be roughly calculated on the basis that every cubic foot will hold 50 to 55 pounds of green fodder. Even a same-size pit will hold more of a fine fodder such as grass, than of a coarse fodder such as *cholam* or teosinte. The depth of the pits can be even 12 to 15 feet if the water-table is sufficiently low. Too small pits should be avoided as then there is more of surface contact and more spoilage. Circular pits are better than rectangular ones because they have comparatively less of surface contact. It is worth-while bricklining the sides of the pits to reduce spoilage along the sides.

Before filling them, the pits are thoroughly cleaned and padded with dry straw or hay all along their sides and on the bottom to prevent fodder coming into direct contact with the earth. Care is taken to see that the padding along the sides is perfect, as any air-pockets left will lead to mould formation and decomposition. Green fodders after harvesting are dumped into the pits and spread evenly on the bottom. The best time for harvesting a fodder for ensiling would be when the crop has just started flowering.

FILLING

It would be better to chaff the fodder before ensiling ; there will be less wastage. If the fodder is found in a withered condition due to a bright sun, it may be sprinkled overwith water at one or two gallons for every 1,000 pounds, as the need may be, after dumping it into the pit.

Molasses and salt are added at the rate of a pound each for every 1,000 pounds of fodder ; the quantity of molasses can be increased to even ten pounds, depending on availability. When the filling is just approaching the ground level, heavy animals like Sindhi bulls or buffaloes may be allowed in to trample over it to secure a thorough packing.

When the filling reaches the ground level, further layers of fodder are arranged more evenly. In this way, it is taken to a height of ten to 12 feet above the ground level and given the shape of a dome on the top. With the sinking down of the material, fodder may bulge out; such portions should be chopped off to allow the whole mass to go down properly. The top and the sides may then be covered with some waste fodder or weeded grass and plastered over with mud.

The whole process of filling takes eight to ten days. The process should not be carried out with any undue haste, nor a long time taken to do it. Any cracks formed due to the further sinking down of the material should be closed with earth. Once the pits are closed, they should be kept air-tight till they are opened for taking out the silage.

Filling of a silo in progress



REMOVING SILAGE

The silage will be ready for feeding in about three months. Once the pit is opened the contents should be used up as quickly as possible to avoid wastage and drying up. The best thing would be to remove a third or a fourth of the top portions of the pit by cutting straight to the bottom with a hay or silage knife. Similarly, another one-third or one-fourth portion may be taken out when needed. This would considerably avoid drying of the silage. The total wastage and dryage would vary from 15 to 35 per cent, depending on the nature of the fodder ensiled and the weather conditions at the time of ensiling.

Given below is the cost of ensiling 3,20,000 pounds of fodder in a pit 36 ft. x 20 ft. x 8 ft.

		Rs.
Labour charges by way of loading, carting, and filling fodder, and covering the silo		180.00
Cost of molasses : 300 pounds at 0.03 per pound		9.00
Cost of salt : 300 pounds at 0.03 per pound		9.00
		198.00
	or	200.00
Cost of preparing a 100 pounds of silage		0.06

It's Sure Economical to Fertilize Linseed

by

A. R. Khan *and* **G. P. Gupta**
Indian Agricultural Research Institute
New Delhi

RECENT studies at the Indian Agricultural Research Institute, New Delhi, have clearly shown that the linseed crop yields better if given nitrogen.

Linseed happens to be one of the five major oilseed crops of India, and is extensively grown in Madhya Pradesh, Uttar Pradesh, Andhra Pradesh and Bombay. It is mainly cultivated for the seed which is either exported or pressed for oil. Linseed oil finds great use in the varnish and paint industries. The average yield of linseed in India, however, is very low. In view of the important position that it occupies in the export trade of the country, it is essential that its production should be stepped up.

The variety used in the experiments was *RR9*. Nitrogen at 30 and 60 pounds per acre was tried. The fertilizer used was ammonium sulphate, and the doses one maund and 35 seers and three maunds and 30 seers. It was found that the yield in the first case increased by 37.8 per cent (4.78 maunds) and in the second case by 59.7 per cent (7.07 maunds), compared with no-fertilizer treatment. However, there was a decline in response when the dose was increased.

Linseed is a crop with a low nutrient requirement. It removes less nutrients from the soil per acre than does wheat. Under Delhi conditions, it does not respond to phosphorus and potash application, so nitrogen seems essential for it.

From the economics point of view, the 30-pound treatment gave a net increased return of Rs. 90.68 and the 60-pound treatment a net increased return of Rs. 121.07, over no-fertilizer treatment. The price of linseed has been taken as Rs. 24.75 per maund and that of ammonium sulphate as Rs. 14.00 per maund.

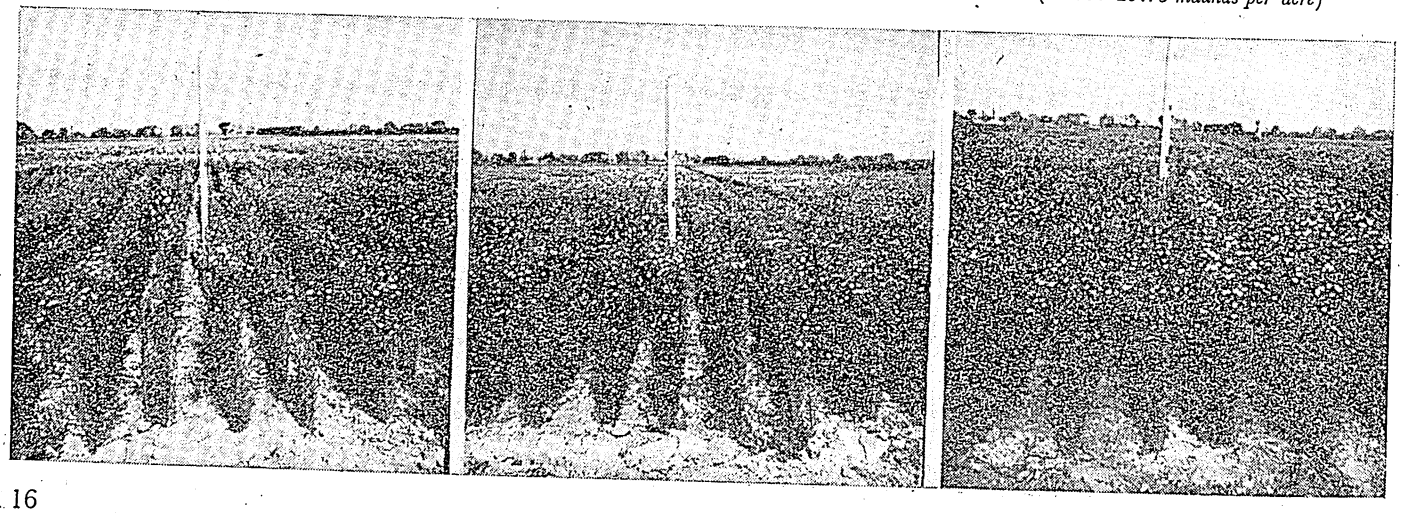
Nitrogen at 60 pounds per acre was found to be the most economic and remunerative dose with irrigation in the alluvium tract in a double-cropping pattern. When linseed preceded fallow, it did not respond to a high dose of nitrogen and the optimum requirement was found to be 30 pounds. Fertilizing linseed, therefore, is a sound and economic practice.

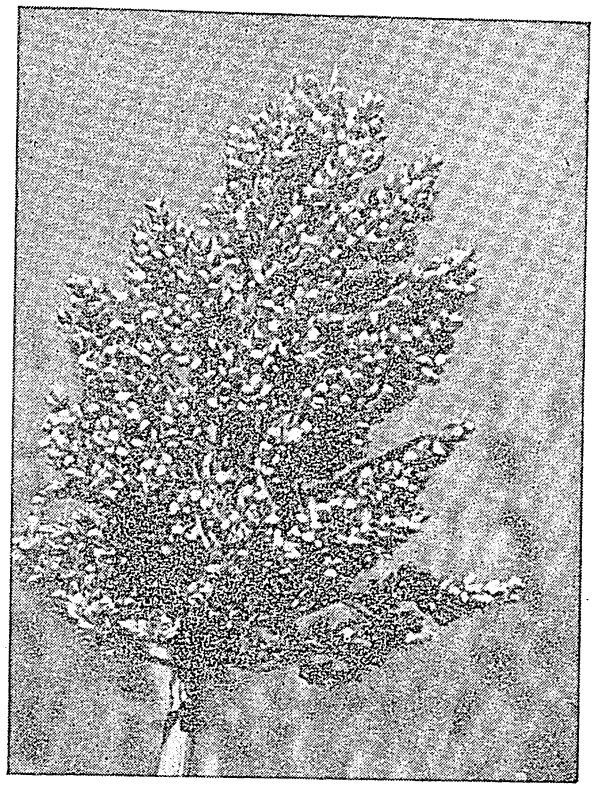
Linseed grown with...

...no nitrogen
(*Yield: 12.68 maunds per acre*)

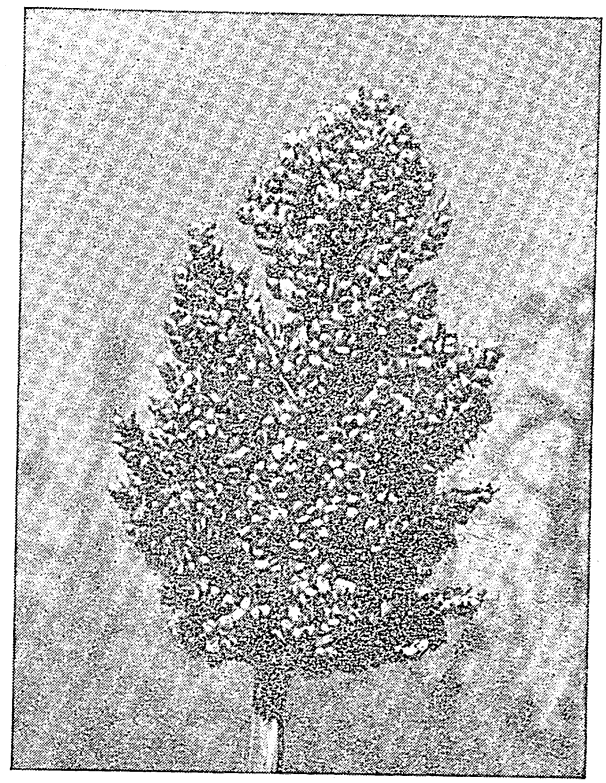
...30 pounds nitrogen
(*Yield: 17.46 maunds per acre*)

...60 pounds nitrogen
(*Yield: 19.75 maunds per acre*)





Gwalior 304



Gwalior 82

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for Madhya Pradesh farmers

TWO new varieties of *jowar* are now available to farmers in northern Madhya Pradesh. They are *Gwalior 304* and *Gwalior 82.*

In northern Madhya Pradesh, *jowar* is grown on 6,76,000 acres giving an outturn of 1,66,000 tons. The two new varieties are specially recommended for Gwalior, Bhind, Morena and Datia districts. The soils of this region are light, comprising sandy and clayey loams. Both the varieties are tall and vigorous-growing, and superior in grain quality and yield compared to the existing local and recommended varieties.

GWALIOR 82

It is a yellow-grained variety with semi-compact panicles. The glume colour is brown. The grains are bold, the weight of a 1,000 grains being 34.0 grams. The average grain yield is 750 to 900 pounds per acre. The crop takes 110 days to mature.

GWALIOR 304

This is a variety with bold, chalky-white grains which are very attractive. The panicles are lax. The glume colour is brown. A 1,000 grains weigh 34.0 grams. The average yield of grains is 750 to 900 pounds per acre. The crop ripens in 120 days. This variety is very easy to thresh.

—S.M. Wakankar and C.N. Mahadik

Not only better tobacco, but

15 per cent more tobacco

if you "place" fertilizer with this implement

by
N. R. Bhat
and
K. Kameswar Rao
Central Tobacco Research Institute
Rajahmundry

DEEP placement of fertilizer, whether only nitrogenous or complete (N, P and K), has been found to increase the yield and improve the leaf-quality of flue-cured Virginia (cigarette) tobacco in Andhra Pradesh. Such an application has raised the cured leaf and bright leaf yields by over 15 per cent at the Central Tobacco Research Institute, Rajahmundry. Keeping this fact in view, a simple bullock-drawn implement has been devised at the Institute to meet the needs of tobacco growers for deep placement of fertilizer.

The rain-fed flue-cured Virginia tobacco grown in Andhra Pradesh develops a deep root system. This enables it to feed in the subsurface zone containing adequate moisture required for the absorption of nutrients during the active period of its growth. Naturally, therefore, a much better response results when fertilizers are placed at a depth of about six to nine inches in the subsurface zone.

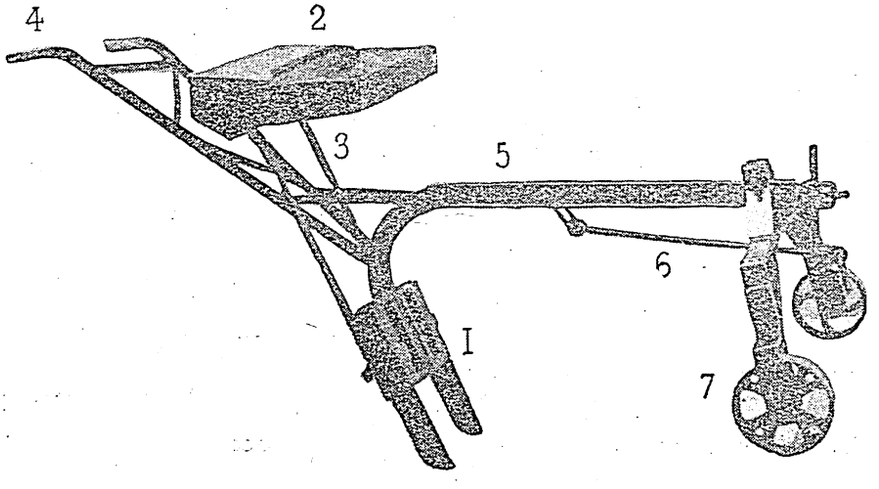
TWO ASSEMBLIES

The implement, named the "Deep Fertilizer," consists of two assemblies: a rear assembly comprising the deep fertilizer, a hopper for the fertilizer, two fertilizer-dropping tubes connected to the bottom of the hopper, and operating handles for the implement; the yoke assembly in the front comprising a central beam, a central tie-rod for hitching the implement to the yoke to which are attached two wheels, one on either side, for steadying and guiding the implement.

The deep fertilizer in the rear assembly has two solid heavy rectangular welded steel housing blocks securely connected by bolts and nuts to either side of the central beam. To these blocks are attached the two soil-cutters which are also of mild steel bars of $2\frac{1}{2}$ inches $\times 1\frac{1}{2}$ inches sections and 17 inches long with profiled cutting edges at the bottom.

Just above the central beam, in front of the two wooden handles, is the hopper or the tray made of thin, galvanized iron sheet for holding the fertilizer. The hopper consists of two chambers with a sliding, vertical partition in the centre. In one of the chambers, a measured quantity of the fertilizer sufficient for a certain number of rows is put. The second, the feeding chamber, has two openings provided at the bottom, to which are connected by means of welded couplings two one-inch diameter tubes for dropping the fertilizer. These tubes are firmly clamped to the hind side of the two soil-cutters. Here, special mention may be made of the fact that the lower ends of the tubes are purposely

1. **The deep fertilizer**
2. **Hopper**
3. **Fertilizer-dropping tubes**
4. **Operating handles**
5. **Central beam**
6. **Tie-rod**
7. **Wheels**



kept above the soil surface to prevent the tubes from getting clogged or obstructed by the soil.

SIMPLE WORKING

The implement is used when the soil is fit to receive the fertilizer for the tobacco crop: this is either at planting time or earlier up to a month prior to planting. It works in a simple manner, like a plough, with the power of only one pair of bullocks. The soil-cutters secure two deep soil cuts of at least six inches. A cut of up to nine inches can be secured and maintained by applying weight to the implement. This may be done by placing on the beam, at the foot of the handle, one or two small sand-bags.

When the cuts are being made, the farmer drops the required quantity of fertilizer into the feeding chamber with his hands. The fertilizer passes down the tubes and drops instantaneously at the bottom of the deep cuts, closely behind the soil-cutters, before the cuts are covered by loose soil from the sides.

AT REQUIRED DEPTH

Thus, the implement secures placement of fertilizer at the required depth of up to about nine inches in parallel lines on either side of the planting strip. When, later on, the crop row is planted along the centre of the strip, it will have the fertilizer lines six inches away on either side.

The Deep Fertilizer was tried successfully for flue-cured Virginia tobacco on the Rajahmundry Institute farm in the year 1957-58. The soil on which the crop was grown was heavy, black cotton soil, containing about 60 per cent clay. The fertilizer was placed at a depth of about six inches, the depth having been secured and maintained by weighting down the implement with sand-bags. This was done about a week before planting when the surface soil was dry and suitable for the operation.

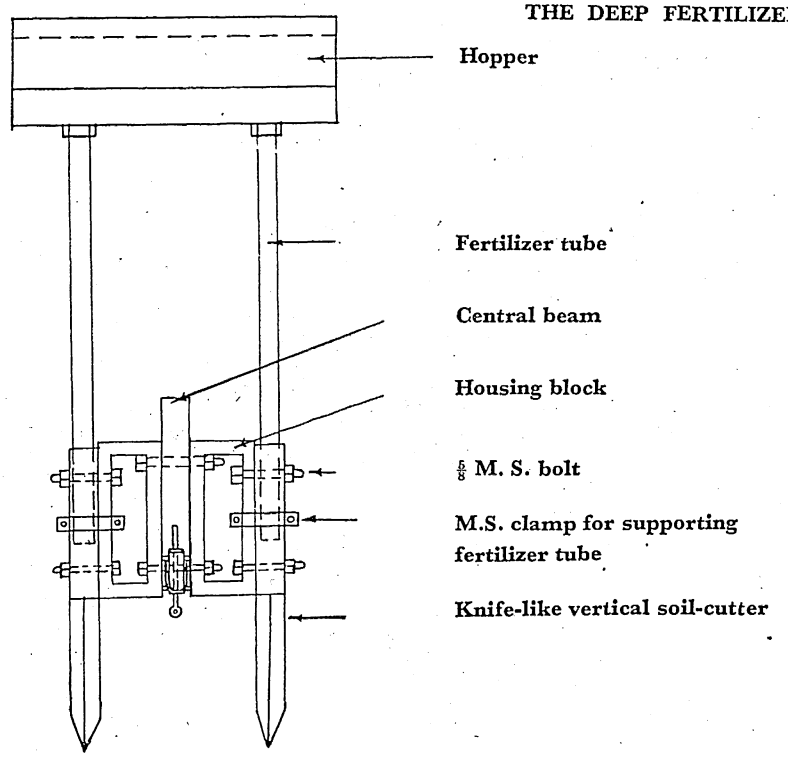
MORE YIELD

In an experiment to compare the deep placement of fertilizer by this implement with fertilizer application in the plough furrow (about two to three inches deep), the following results were obtained.

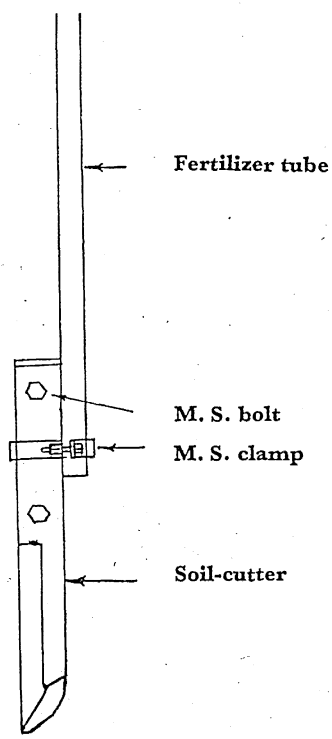
	Yield in pounds per acre		*Estimated cash return per acre*
	Total cured leaf	*Bright leaf**	*Rs.*
In plough furrow two to three inches	825	363	720
By the "Deep Fertilizer" six inches	990	427	957

*Bright grades make the prized leaf in flue-cured tobacco and usually fetch over 60 per cent of the income from the total harvest

CONSTRUCTION DETAILS OF THE DEEP FERTILIZER



Front elevation



End elevation

The Worm That Spins Tasar

by
Chow Kuang-ming
and
Chien Ta-yuan
Sericultural Institute
Academy of Agricultural Sciences of China



An adult tasar silkworm in the fifth molt

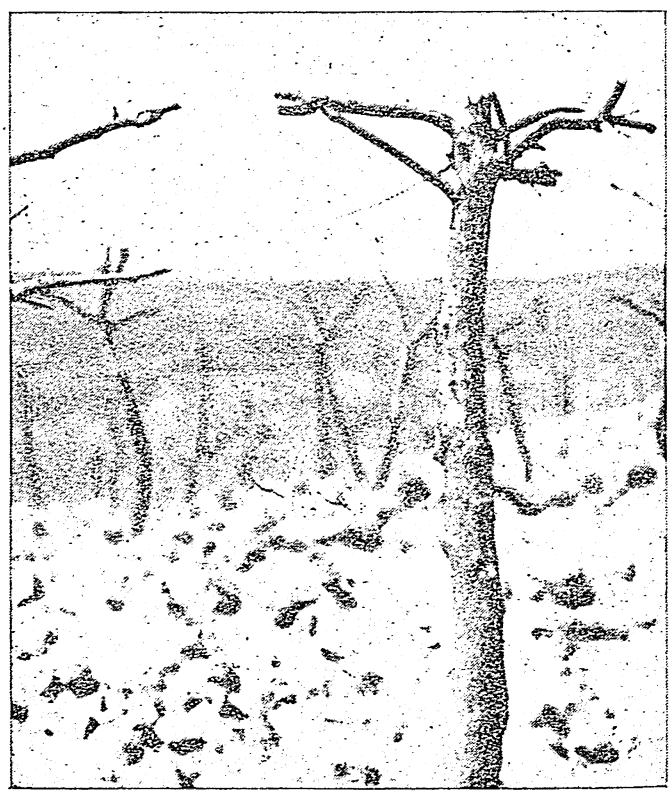
The tasar, tusser, or tassah silkworm, *Antheraea pernvi* G. Meneville, in terms of economic significance, is one of the most important silk-spinning insects. In the classifica-

THE tasar silkworms have been reared in China for centuries. As far back as 1,800 years ago, farmers collected the naturally produced tasar silkworms from the mountainous regions and reared them as a source of silk. It was not until the last several decades that this species was introduced into Korea and Japan. It was naturalized in the Soviet Union from north-east China in 1930.

So far, China still leads in the production of tasar silk, and it no doubt plays a definite role in the economy of the country. Of the total annual world output of the silk, more than 90 per cent is produced in China. The silk-producing areas of China are mainly in the provinces of Liaoning, Shantung, Honan, Kweichow and Szechwan. In the north-east provinces, the yield amounts approximately to 70 per cent of the total of China.

As to quality, the silk produced by the tasar silkworms is by no means inferior to that by the domesticated ones. Besides being used as material for textiles, the silk provides industry with powder bags, parachutes, acid-proof work-clothes and equipment. It is also being used extensively in the manufacture of flexible cords and tires.

A year old tree



tion of entomology, it belongs to the genus Bombyx, family Bombycidae, order Lepidoptera, class Insecta, phylum Arthropoda.

GENERAL HABITS

The silkworm larvae chiefly hatch from the egg-shells between 6 and 10 a.m., especially from 7 to 8 a.m. The newly hatched larva is, as a rule, fond of eating its own egg-shell or chorion, while the exuviated insect swallows its own old epidermis. Experienced rearers point out that chorion and epidermis intake is a striking sign of a healthy individual. This experience may be considered scientific.

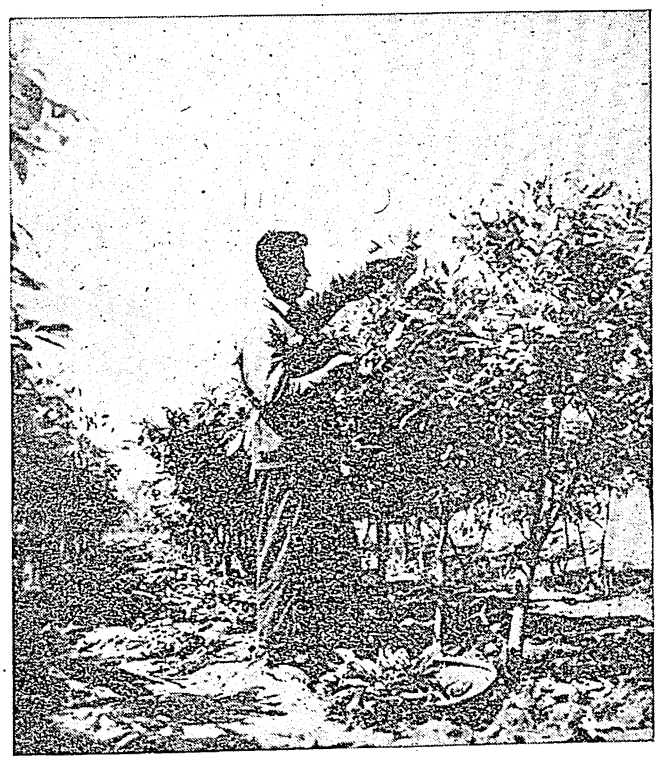
It is observed that young silkworm larvae are usually inclined to crowd on the head cluster of a tasar tree, ingesting young and tender leaves as food. On the surface of these leaves, aggregations are generally formed. Throughout the various stages of development the larvae instinctively drink water. Such fondness for water is just not true of the ordinary silkworm. After a prolonged drought one can see them taking in raindrops with their mouths.

During the young larval stage, the larvae aggregate on twigs where they like to consume tender leaves. Ordinarily, after the second instar they remain to ingest tender leaves, but their gregarious habit becomes gradually weakened.

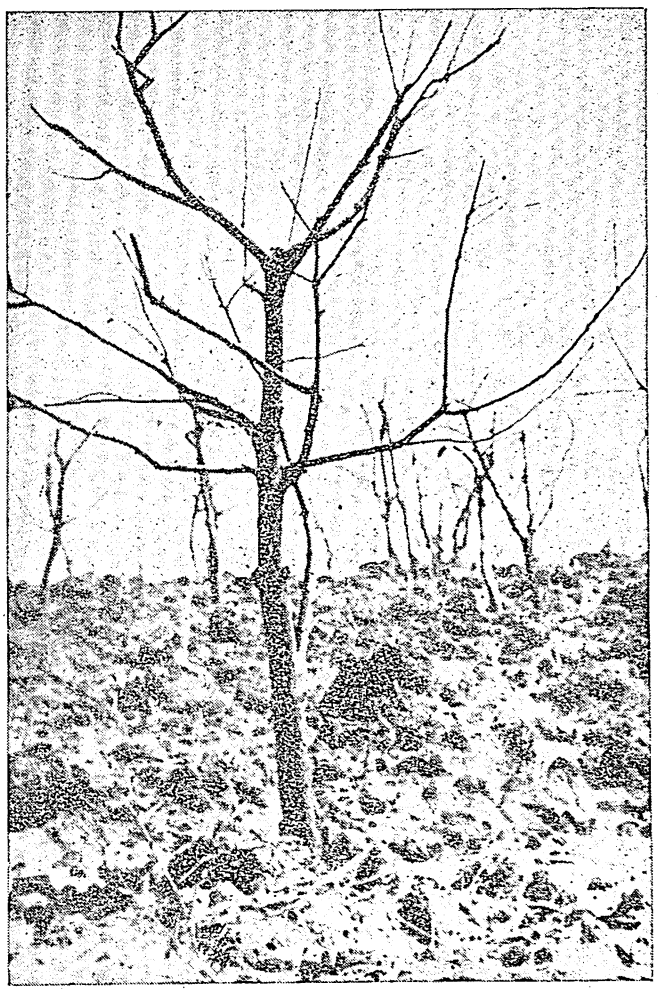
The grasp of the pedes spurii and pedes abdonimales of the caterpillars is extremely strong. When occasionally attacked by a bird or other enemy, only the upper part of a caterpillar may be eaten away, but its pedes spurii will hold stubbornly on to the twig. Consequently, in collecting these individuals it is quite necessary to lift them up as quickly as possible by the pedes spurii, otherwise they may be injured. The grasping power of their pedes spurii and pedes abdominales helps them weather storms and other adverse natural conditions.

The caterpillars are very sensitive. A sudden vibration of tree or sound may serve as stimulus for their immediate cessation of ingestion and mobility. A full grown caterpillar is also very active in seeking the best place to spin its cocoon. At first, it spins a supporting loop of silk on two or three leaves among which the cocoon is constructed. As soon as the shell of the

Trimming and transferring



A two-three year old tree



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rudimentary cocoon is formed, it climbs out through a small hole previously provided by itself at one end of the cocoon, and crawls up along the twig to build a hinged portion of the cocoon, then finds its way back into the cocoon to continue spinning. This is also a distinguishing characteristic of the tasar silkworm.

In general, a tasar silkworm will be fully developed to spin a cocoon after four instars and five molts. The number of instars and ecdyses undergone by a worm is relatively inconstant. When the natural environment is unfavourable—weather too dry, leaves dry quickly, or other physiological disturbances, it may undergo five instars and six molts. Perhaps this is generally true of all wild silk-producing insects.

During the first instar, the caterpillar may sleep on the top or inside of the leaf. After the second instar, it usually rests with its abdomen upwards and back downwards on the inside of the leaf, the bottom or sheltered side of the top twig, or on the vein.

The tasar silkworms feed on leaves of a wide variety of the tasar trees. Writers differ greatly as to the names of these trees, given according to their form, colour and germination. At present, those most commonly used for feeding the worms are of three main varieties, viz., *Quercus acutissima* Carr., *Quercus serrate* Thunb and *Quercus dentata* Thunb, as well as a number of food plants such as *Salix viminalis* Linn. and *Betula japonica* Sieb and Wink.

VARIETIES

The main varieties in China at the present time are those which have been selected over a number of years by silkworm rearers, but few of them have ever been examined and arranged. Only comparatively recently, research organizations in China have begun to cultivate new varieties. The early sericulturists have enumerated the performance of the tasar silkworms as follows.

Greenish silkworms. They are bluish green in colour varying from dark blue to light blue. The former is of coarse cuticle, slow in locomotion, appetite great, resistance to disease weak and spinning at a later stage. The latter is active and vigorous in locomotion, but appetite is delicate, spinning starts at an earlier stage and adaptability is high.

Yellowish silkworms. The members of this variety are yellowish coloured varying from sable yellow, pale yellow to almond yellow. The sable yellow are highly adaptive and eat voraciously. Their stage of development is comparatively long, and the cocoons made are bigger in size. But they are frequently liable to damage caused by early frost. The pale yellow are adaptive too, though they have a delicate appetite, and the stage of development is shorter. The size of their cocoons is small but of a very fine quality. The adaptability of the almond yellow closely resembles that of the preceding two and they are, therefore, preferred by some silk breeders.

Greenish yellow silkworms. These are with greenish yellow cuticle. Their appetite is moderate, but adaptability is strong and the silk of superior quality. They are the most favoured species raised in Liaoning at present.

Silvery white silkworms. The cuticle of these individuals is silvery white, somewhat transparent and brilliant. The hues may be distinguished from pure white to pearly white. The former is called the silvery white and the latter water blue. But in reality the two are of the same variety. Their appetite is moderate, and they spin medium-sized cocoons of the best quality at a later stage. Low resistance to disease is their weakness.

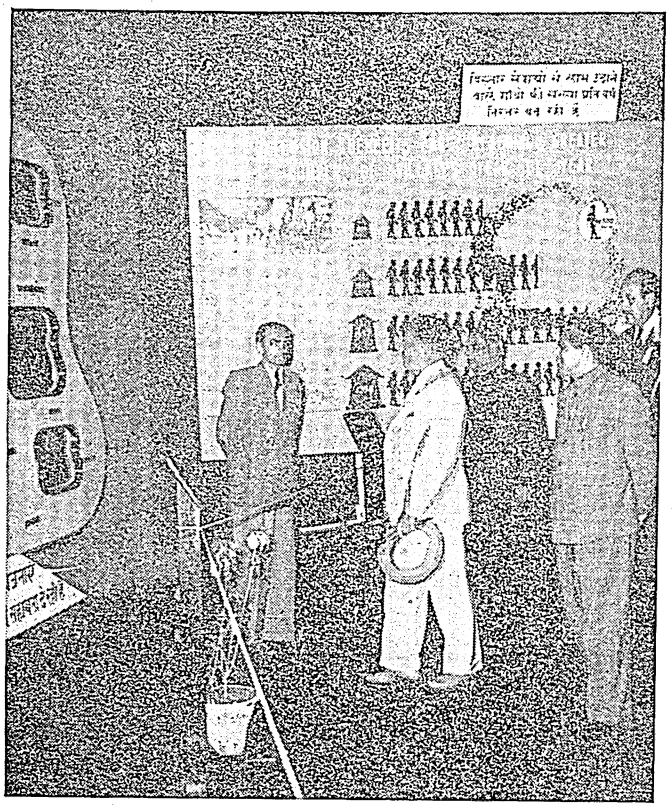
Shantungs. The so-called Shantungs are well-known Chinese silkworms of various shades of colour. Some are dark blue, others light blue. But they live under much the same cultural conditions. In general, they are physically stout, having a good appetite, a longer stage of development, and a higher percentage of cocoons, and are preferred by the local farmers.

METHODS OF CULTIVATION

Egg-warming. This is completely similar to the practice of accelerating the embryonic development of the domesticated silkworms. When the period to commence the warming of eggs comes around, they are brought to the heating chamber for the purpose of acceleration by reasonably increasing temperature and humidity. The time of incubation, however, should correspond with the development of leaves of the tasar tree.

In Liaoning localities, the cultivation of the spring stock generally commences in late April, in Shantung localities, in the middle of April, while in Kiangsu localities such as Chenkiang and Yangchow, in early April. The optimum temperature for acceleration may be varied in different localities. In the North-east, the starting point is 16°C (60.8°F). On the following day, it is raised to 17°C (62.6°F) and on the third day, to 18°C (64.4°F), where it remains as the mean temperature till hatching takes place. In Shantung, however, the prevalent natural temperature is taken as the starting point with an increase of 0.5°C each day up to 18°C, where it is kept as the mean temperature. The preferred temperature for warming eggs adopted by the Sericultural Institute is 60°F on the first day with a

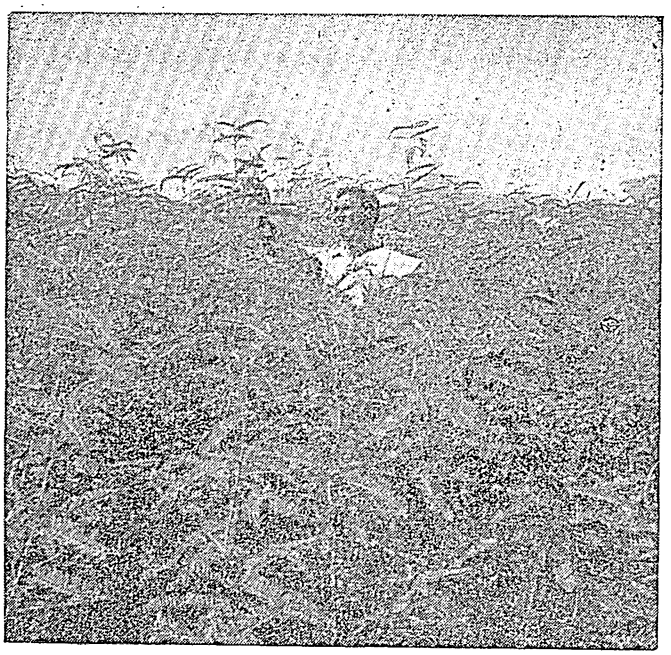
CONTINUED ON PAGE 38



MARSHAL TITO AT "INDIA 1958"

His Excellency Marshal Josip Broz Tito, President of the Federal People's Republic of Yugoslavia, being shown round the Food and Agriculture pavilion at the "India 1958" Exhibition in New Delhi which he visited on January 15, 1959. Extreme right is Shri A. M. Thomas, Union Deputy Minister of Food.

The Village Leader of Veeravalli Block and his *Sesbania* crop



GRASSHOPPERS GET SPRAY FROM AIR

About 15,000 acres infested with the Deccan wingless grasshopper, threatened severe damage to the mixed crop of *jowar*, groundnut and tobacco in south Satara district of Bombay State during October, 1958.

The Directorate of Plant Protection, Quarantine and Storage, in collaboration with the State Government, carried out aerial spraying with insecticide on about 7,033 acres against the pest. Due to the operation, there was a total expected saving of about 9,000 maunds of foodgrains worth about Rs. 1,08,000. On an average, 95 acres were covered in one flying hour and 500 acres in one day, though the maximum area covered in a day was 925 acres. In all, 15,176 gallons of insecticide solution were sprayed in 73½ hours.

News and Pictures

If the good work that some trained Compost Leaders in Madras State are doing catches on, the State would surely achieve its target of producing half a million tons of manure by the end of 1959-60.

Leader S. Ganesan of the Madurantakam Block first set an example by digging improved type of trenches in his own fields and composting green leaf and other organic wastes in the proper way. It was then easy for him to persuade the other farmers of the villages Pathur, Arasarkoil and Chethimedu under his charge, also to do so. In Pathur, even the women and children came forward and 54 pits were completed within a month and a half—sufficient to give 380 tons of valuable compost. He plans to cover all the villages at least ten miles around in this way and produce a minimum of 1,500 tons of compost.

Similarly, Leader Visuwasam of village Mylapore in the Dindigul N.E.S. Block has also shown great initiative. Visuwasam who also happens to be the president of the village *panchayat*, has chalked out a plan according to which each farmer would be required to prepare ten tons of compost per year for every acre

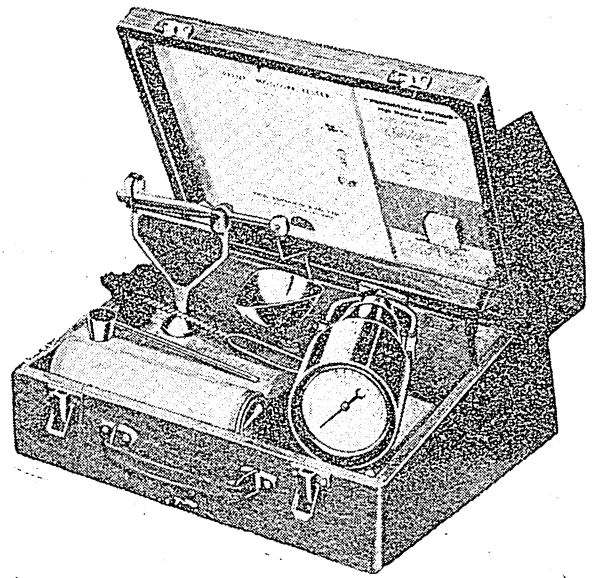
Leader Ganesan explains to villagers the way to dig proper trenches



of his land. Thirty-six compost pits of the size 15 ft. x 8 ft. x 3 ft. and six of 30 ft. x 8 ft. x 3 ft. have already been completed. The villagers of Avrampatti, Kunjanampatti and Kamakshipuram have gone even further —they have decided to organize and dig one compost pit for every acre of their land.

Green manuring too is receiving equal attention. A Village Leader in the Veeravalli N.E.S. Block has put an extensive area—500 acres, under *Sesbania speciosa*. Because of this, the average per-acre paddy yield from this block is estimated to go up to 35 maunds.

R. P. Talati



MOISTURE TESTER

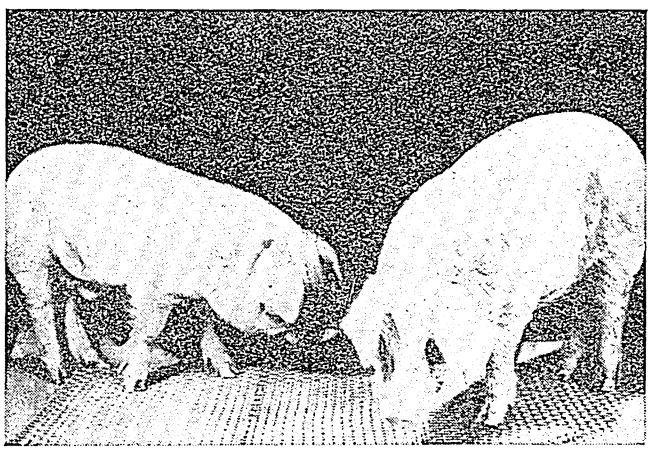
Whatever the harvesting method, the moisture contained in the structure of the grain as well as on the outside is vital to the farmer. If the grain is too wet, harvesting has to be postponed, as otherwise it would spoil on storage. To provide the farmer with a method of determining the water content of grain, a firm in England has patented an apparatus.

The principle of the apparatus is the instant release of gas from the Absorbent provided on contact with the moisture in the sample. The pressure of the gas released registers on the dial gauge indicating the percentage of moisture. A Grinder is provided to obtain a ground sample, which is essential if the true moisture is to be obtained. This allows the reading to include the moisture which is within the grain structure. The ground sample is weighed on a counterpoised balance (no weights needed) which is included in the complete outfit. This comprises the actual testing implement: a counterpoised balance, scoop for measuring Absorbent, a tin of Absorbent sufficient for 50 tests, a cleaning brush, a spare rubber washer and complete working instructions.



FARMERS GO SIGHTSEEING

A number of *kisan* parties comprising nearly 700 farmers from Bombay, Gujerat and Madhya Pradesh, recently went on a sightseeing tour of the different parts of the country. They also visited the Forest Research Institute and College, Dehra Dun, where some of them are seen examining the exhibits in the Timber Museum.



BOON TO LIVESTOCK RAISERS

The difference in size of the two young hogs shown here is an evidence of the boon to livestock raisers which arose from the discovery of the wide-range antibiotic Aureomycin chlortetracycline ten years ago. Both are from the same litter. Both received the same ration with one difference—the hog on right had a tiny amount of Aureomycin added to its feed. Such growth gains mean more meat production in less time at less cost to the farmer.

Experience in almost every country in the world has proved the value of a feed supplement containing both vitamin B12 and Aureomycin for livestock, including beef and dairy cattle, laying hens, poultry, swine, turkeys, sheep and calves. Animals fed on such an antibiotic supplement are more free from disease, put on weight more quickly, and consume less feed per pound of weight gained than do animals given a ration without it.

LIBRARY

what we need is a good fodder programme

by

T. S. Gill
Agriculture Division
Planning Commission
New Delhi

IT has been estimated that with proper feeding, an ordinary village cow in India would yield 50 per cent more milk on an average; in the case of the generally well-cared for buffalo, the increase may only be about 15 per cent; the efficiency of the draught-cattle of the country as a whole would go up by 60 per cent. But the available supplies of concentrates and roughages can feed only about 30 and 70 per cent, respectively, of the existing cattle population. That is why it was recommended in the Second Five Year Plan that "gradually attention must be given to the fodder programme as this is an essential basis for the programme of cattle development."

The cattle population of India, including buffaloes, is about 200 million—a fourth of the total cattle population of the world. The importance of cattle to India's economy can be judged from the fact that they contribute no less than Rs. 664 crores per year, which is about 16 per cent of the national income from agriculture, to the gross national income. This includes the value of the animal power used for draught purposes, for agricultural operations and for the transport of commodities.

However, the quality of our cattle, whether draught or milch, is very poor. Ten per cent of our cattle population comprises inefficient, old, nondescript and useless cattle. The Cattle Preservation and Development Committee in 1947 estimated the unproductive adult cattle at 11.5 million. They are a serious drain on the already scanty feed and fodder resources of the country. Again, some of our best breeds are met with in those parts of the country which receive very small amounts of rainfall, generally have no means of irrigation and are subject to periodical famine. The portion of the cattle population which is worth preserving is, therefore, affected.

The feed and fodder resources of the country can be improved by

(*i*) introduction of exotic types of nutritious fodders;

(*ii*) evolution of high-yielding strains of various fodder crops;

(*iii*) adoption of improved techniques of production;

(*iv*) development of grassland farming;

(*v*) improvement of natural grazing grounds in forests and the village grazing lands (*shamlat* lands);

(*vi*) preservation of surplus fodder; and

(*vii*) development and use of subsidiary feeds, e.g., mango seed kernel, *jaman* seed, tamarind seed, fishmeal, slaughter-house wastes, etc.

Green fodder not only improves the condition of livestock, but also brings down the maintenance cost of animals by reducing the quantity of concentrates required. Unfortunately, very little research has so far been done in the country on the introduction of new fodders from other countries, such as several types of peas, lespedezas, alfalfa, clovers, teosinte (*makchari*), beans, grasses, etc. In the Punjab, however, a good deal of work has been done on fodders, and a plan for raising fodder crops and grasses which would supply green fodder throughout the year, has been evolved. The Punjab farmer now has different high-yielding new varieties suited to varying conditions of soil and climate to choose from as shown in the table on the next page.

Harvesting season	*Fodder*	*Crop*	*Sowing season*	*Yield per acre (in maunds)*
January	Japanese mustard, berseem (Egyptian clover), lucerne (alfalfa)	Japanese mustard	End of September to October	300 to 600
February	Early oats, berseem, lucerne	Berseem	End of September	600 to 800 (five to six cuttings)
March	Oats, berseem, *metha* (fenugreek), *senji*, lucerne	Oats	October-November	300 to 400
April	Late oats, berseem, lucerne	Lucerne	October-November	800 to 1,000 (eight to ten cuttings)
		Metha	October-November	300 to 350
May	Berseem, Sudan grass, lucerne and grasses	*Senji*	October	300 to 400
June	Sudan grass, maize, cowpeas, lucerne and grasses	Turnip,	September-October	400
		Sudan grass	March-April	500 to 600 (three cuttings)
July	Sudan grass, *jowar* (sorghum), cowpeas, lucerne and grasses	*Jowar*	April to July	300 to 400
August	Sudan grass, *jowar*, cowpeas, lucerne and grasses	*Makchari*	July	400
September	Sudan grass, *jowar*, *moth* (*Phaseolus* sp.) cowpeas, lucerne and grasses	*Moth*	April to July	200 to 300
October	*Jowar*, *makchari* (teosinte), *guar* (pigeon peas) and lucerne	*Guar*	July	300
		Cowpeas	April to July	200 to 300
November	*Makchari*, berseem, mustard, lucerne	Elephant grass	February	600 to 800 (four to five cuttings)
December	Berseem, lucerne, mustard, turnip	Guinea grass	February	300 to 400 (four to five cuttings)

It is time that work on similar lines was taken up by the other states also. Leguminous fodders such as lucerne, berseem, cowpeas, field peas, etc., not only improve the health of animals, but if included in crop rotation also improve soil fertility. The Kudzu vine would not only help in checking soil erosion on steep slopes, but also supply green fodder both for grazing and stall feeding.

IMPROVED TECHNIQUES

Due to the extreme pressure of population, both human and cattle, there is a heavy demand on the cultivated land for growing foodgrain and fodder crops, and for grazing. There is very little scope for raising extensive pastures for grazing cattle. In the absence of good grazing and lack of concentrates, stall-feeding the animals with green fodder is the only alternative.

The yield of green fodders, therefore, needs to be increased by intensive cultivation and improved techniques. The growing of fodder crops has to be popularized. This policy is being pursued in the Key Villages where adequate arrangements are made for the production and distribution of fodder seeds, roots and cuttings of the desired varieties. In order to make the growing of new fodder crops popular, cultivators are being provided with the planting material at a 50 per cent subsidy. In addition, it is highly desirable that the usefulness and advantages of growing nutritious fodders for the cattle are driven home to farmers through appropriate information measures.

GRASSLAND FARMING

As commonly understood, grassland agriculture is not limited to grasses but also embraces their common associates of the legume family, such as clovers, lespedezas, peas and beans. In grassland agriculture, which is another name for mixed cropping, grasses and legumes are raised together according to the system of management best suited to land use with ample provisions for other crops as needed. Under Indian conditions, grassland agriculture is better than any other type of farming, as it provides more organic

matter to the soil. The legumes harbour beneficial organisms of all kinds. Their innumerable roots penetrate the soil and improve its physical condition. On sloping lands, the sod would control erosion and would simplify the maintenance of contour terraces and watercourses. This type of mixed cropping should be introduced into areas where cattle-raising forms an important part of the agricultural economy.

NATURAL GRAZING

Our main grazing lands are either in the forests or near the forests. These resources are estimated at 85,000 square miles, but are accessible only to a small percentage of animals. They can, however, be developed and reserves of fodder built up, both for grazing and as security against famine. The fodder species in these regions are inferior. Large areas of range lands in these regions are so badly misused that they are in an advanced stage of deterioration. Where the forests are managed by the State Departments of Forests, there is some regulation and supervision, though not always satisfactory. In some state-owned forests even there are open pastures where no stocking limits are prescribed owing to the large demand for fodder. In Bombay State, the forests are classified as

(*a*) those completely closed to grazing, where the most valuable timber is raised ;

(*b*) those where only cutting of the grass is authorized ;

(*c*) those open all the year round.

In view of the grazing needs, state forests should only be placed in the first two classes, and rotational grazing should be practised. According to experts, four years of rotational or restricted grazing would improve both the quality and quantity of the forage production per unit of area. If stocking cannot be restricted everywhere, at least wherever possible, the stocking rate should be fixed according to the land capacity. Complete closure to grazing is sometimes indispensable for the restoration of deteriorated natural grazing grounds.

Tests carried out in the Punjab show that closure for a few years improves the position of the cover, but a protracted closure gives the most valuable forage species. We should, therefore, prefer rotational or deferred grazing considering that properly managed grazing will enable the admission of larger herds than uncontrolled grazing.

In the Second Five Year Plan, a sum of about Rs. 55 lakhs was provided for improving pastures in the forest areas. Satisfactory progress has been made in the States of Bombay, Madras and Himachal Pradesh, and a sum of about Rs. 20 lakhs has so far been spent on improving grazing lands.

There are considerable grazing lands in the areas under *ryotwari* settlements, usually known as village commons (*shamlats*). These lands are now being progressively broken up for cultivation by the owners. It is desirable that, wherever possible, the management of these lands is passed on to suitable local agencies which should introduce rotational grazing by erecting suitable enclosures. Every livestock-breeding farm or a state-owned agricultural farm should have improved pasture land which should be managed on the most up-to-date lines so as to serve as a demonstration centre for the people and a training ground for the staff in large-scale pasture development.

PRESERVATION OF FODDER

Surplus grass from some remote grazing grounds in the forest areas could be turned into hay, and either be kept as reserve to meet an emergency, such as famine, or supplied to other areas. A pilot scheme has been sanctioned with a view to studying the possibility of building such "fodder banks." The scheme has been taken up at the Cattle Breeding and Stud Farm, Hingoli, District Prabhani in Bombay State.

In addition to making hay of various grasses and some of the leguminous and indigenous fodder crops, such as stalks of *jowar* and *bajra*, the surplus green fodder can also be turned into silage. This has been done at the various Government Agricultural Farms, Livestock and Dairy Farms and on the various military farms in the country. The advantage of silage is that the fodder can be preserved in green form without deterioration for use when such fodder is not easily available. It also adds variety to the ration and provides succulent feed for economical milk and draught production. There is an advantage of using green weeds for the purpose. The silage has got to be stored in towers or upright metal silos or in silo-pits dug in the ground. Trench or modified trench-type silos are less expensive to construct, but equally efficient. A subsidy of 25 per cent by the Centre and 25 per cent by the State Government has been agreed to for encouraging the conservation of surplus green fodder in this way.

SUBSIDIARY FEEDS

Since the nutritive potentialities of the natural grasslands are limited, concentrates play an important role in the feeding of livestock in India. There is also a great discrepancy between the supply and demand of the cultivated high-protein fodders, as shown in the table on the next page.

Feeding stuffs	*Estimated requirements*	*Present supply*	*Deficit in supply*
		(*in million tons*)	
Straw or *kadbi*	190	130	60
Green fodder	289	111	178
Grazing (as green grass)	527	453	74
Oilcakes	11.53	2.88	8.65
Maize	8.87	7.70	1.17
Barley	8.41	2.34	6.07
Gram	8.24	3.59	4.65
Cotton seed	3.73	1.28	2.45
Bran	4.83	1.97	2.86

In addition, about 1·24 million tons of husk-*chari* from gram and pulses are available, having a nutritive value of approximately that of bran. Continuous efforts throughout the country need to be made to bridge this gap by taking up suitable schemes for enhancing the production of fodder resources and controlling the increase in the cattle population, especially the uneconomic portion of it.

A good deal of work on the development and use of subsidiary feeds, such as mango seed kernel, *jaman* seed, tamarind seed, fishmeal and slaughter-house wastes, has been done at the Indian Veterinary Research Institute, Izatnagar. Those feeds are reported to be valuable concentrates. It has been estimated that it could be possible to obtain about 11 million tons of concentrate feeds on an All-India basis. The main difficulty is that these feeds are very much scattered not only throughout the length and breadth of the country, but even in the villages themselves. It is very difficult to arrange for the collection of these products in substantial quantities. In a village, the quantity in terms of the feed value may be as much as can be obtained by the cultivation of one or two acres of high-protein fodder crops. However, efforts should be made to educate the cattle-owners about the utility of these subsidiary feeds.

All this would require a close co-ordination and co-operation of the various development agencies, namely, the National Extension Service and the Community Development Blocks, the departments of Animal Husbandry, Agriculture, Forests, Co-operation, etc. High priority needs to be given to the areas of well-defined breeds of cattle. Development of the feed and fodder resources should receive the same emphasis as the breeding of superior strains of cattle in the Key Village Scheme.

PINES IN PEAT "PADS"

Academician Pogrebnyak of the U.S.S.R. has elaborated a new method of growing pines in the sands. Up till now sands were ploughed to plant trees. This led to their blowing away and the destruction of the plantations. In order to save the saplings from the wind the scientist proposed planting them under a cover of wild grasses, clearing for the young tree only a small square of soil. But the chief innovation was the utilization of peat "pads" for planting pine saplings. Peat placed in special holes in autumn possesses as is known, considerable moisture capacity, imbibes a good deal of water in winter and, when year-old pine saplings are planted into it in spring, serves as an excellent source of food and moisture for them. By the way, peat is found in abundance not far from the arenas.

The new peat-hill method of planting pines gained general recognition very rapidly. Even in the extremely dry year of 1951 when 82 per cent of trees in the ordinary plantations perished in the Lower Dnieper sands, eight out of every hundred trees took root and survived on Academician Pogrebnyak's plots. In 1952, "Pogrebnyak's plantations" already covered thousands of hectares. During the four years that followed, sylviculturists raised by 50 per cent more forest in the sands than in the preceding 120 years. The strong, healthy trees that have taken deep root in the sands are no longer afraid of the sand storms or draughts. No, the climate has not grown milder here. Last summer practically no rain fell on the sands. And yet some of the teams in the forest farms managed to preserve up to 97 per cent of the saplings.

A scientist who remakes nature has many friends. Vasili Kicha, a self-taught locksmith of one of the forest farms, designed the first machine in the world of placing peat in the sands. His tractor-drawn peat-filler not only portions out the peat and places it in the earth at a definite depth, but automatically leaves a "landmark" by throwing a piece of peat on the surface of the sand. This machine replaces one hundred workers. Two-three aggregates of this kind are enough to fertilize ten thousand hectares of arenas every year, in other words, the entire area stipulated in the State plan.

Another suggestion has been also successfully tested for several years now on the Lower Dnieper sands. The Leningrad agrophysicists I. Revut and D. Dotsenko proposed covering the sands with a layer of a bituminous emulsion which can hold back the movement of the quicksands for a period of two to three years. The sylviculturists have found a great merit in this emulsion. If the area around the saplings is covered with it, the emulsion easily lets through the rain water, but decisively impedes the growth of weeds. This property considerably cheapens and simplies the care of the forest plantations.

—*News and Views from the Soviet Union*

Research Note

HOW CROPS RESPOND TO FERTILIZERS IN BIHAR SOILS

by
P. Sinha
and
S.D. Sinha
Soil Survey Officer, Sabour

RECOGNIZING that fertilizer experiments conducted on farmers' fields rather than on experimental farms provide more reliable results for making recommendations to farmers, trials were taken up in Shahabad district of Bihar State under a scheme with financial assistance from the Indian Council of Agricultural Research. The work which involved a soil survey and simple manurial experiments on cultivators' fields, lasted for three years—from 1952-53 to 1955-56. Here is a brief report of the results achieved.

The number of successful experiments was 290, of which 142 were on paddy and 148 on wheat. The design of the experiments was the simple three-plot one: control, 40 pounds nitrogen as sulphate of ammonia and 40 pounds nitrogen as sulphate of ammonia +40 pounds phosphoric acid. These five *thanas* of the district were selected for the experiments: Arrah, Dumraon, Bikramganj, Sasaram, Bhabhua. The selection of villages and plots was done by the random method.

GENERAL FEATURES

The district is surrounded on three sides by two rivers—the Ganges in the north and the Sone in the east and south. Excluding the undulating hilly tracts which constitute a table-land mostly covered by the Kaimur hills (which are of the Vindhyan formation lying towards south-west), the district is more or less a plain. Of the total area of about 4,400 square miles, alluvial soils cover about 3,600 square miles and hilly tracts the remaining 800.

The climate is tropical, with an annual rainfall of 44.96 inches most of it being confined to three months from the middle of June to the middle of September; the remaining period is more or less dry. The temperature varies from 88.5° F to 67.4°F. Paddy is the most important crop of the district and covers nearly 65 per cent of the total cultivated area, gram coming next with 20 per cent and then wheat with 14 per cent.

SOIL SURVEY

A reconnaissance soil survey of the area was undertaken. Nearly a 1,000 soil samples were collected from soil profiles at every six miles (at smaller distances if the soil changed), observations collected, and a detailed soil map drawn. Besides these, soil samples from the sites of manurial experiments were also analysed.

On the basis of morphology, topography and the main river system influencing the formation of soils in the district, the soils have been classified into different soil series and types, a brief description of which is given below.

Sinha Series. These soils are of the recent alluvium type formed by the flooding influence of the river Ganges, and even now they are flooded every year. Profiles have clear and defined layers varying from six to 19. The texture is sandy to silty loam with occasional clayey layers. Concretions are absent and soluble salts are high.

Arrah Series. The soils under this series are also derived from the Gangetic alluvium, but are of comparatively older origin. Here, four to 12 profile layers are observed, the texture being loam to clay-loam on the surface and tending to be heavier downwards till an abrupt change to sandy layer at the bottom. Calcium carbonate concretions are observed in the clayey layers and the soluble salt contents are low.

Akhgaon Series. This series is formed by the influence of the river Sone due to flooding. Here, four to 11 clearly defined layers with a sandy to loam texture are observed with typical Sone sand deposits at the bottom. No concretions are observed and soluble salts are moderate to low.

Behea Series. This series also is formed by the river action of the Ganges, as the Arrah Series, having a lighter texture as of the Sinha Series, but differs from the Arrah Series in having a porous subsoil. Profile layers, only three to four in number having a low soluble salt content and higher amount of

calcium carbonate distributed all along the profile, are observed.

Piro Series. This series also is a Gangetic alluvium situated far from the river and includes a large area of Shahabad district. The soils under this series have a loam to clay-loam texture on the surface with heavy layers below. The number of layers varies from three to seven. Iron and calcium carbonate concretions are observed throughout the profile and the soluble salt content is low.

Karghar Series. This series, though alluvial in nature as the Piro Series, is formed due to depression in the relief, and topography has played a very important part in its profile development. It is different from the Piro Series in having a heavier texture and more soluble salts, the other features remaining more or less the same.

Dehri Series. The soils under this series are formed by alluvial deposits from the river Sone as well as by hill washings from the Rohtas hills, and as such the texture of the soil is very variable. Varying amounts of gravels and iron concretions are present, the latter being more prominent at lower depths. The soluble salt content is low.

Pajraon Series. The soils under this series are formed by the action of the river Karamnasa and have a sandy texture on the surface followed by loam or clay-loam soils below. Different layers of the profile are clearly defined and range from three to five in number. Some concretions of calcium carbonate are found in the lower depths. The soluble salt content is low throughout the profile.

Kishunpur Series. This series is formed under the influence of the river Durgawati and the soils are of a medium to heavy texture throughout the profile. They contain high amounts of soluble salts, iron and calcium carbonate.

Chainpur Series. This series is formed by the river action of several small rivulets like Gahawar and Shama. It differs from the Kishunpur Series in having a lighter texture on the surface and comparatively much lower soluble salt content, the other features remaining more or less the same.

MANURIAL RESPONSES

The results of experiments falling under the different series showing the average figures of response to the manurial treatments given are indicated below.

Name of series	*Paddy*		*Wheat*		
	40 pounds nitrogen	*40 pounds phosphoric acid*	*40 pounds nitrogen*	*40 pounds phosphoric acid*	*Remarks*
Sinha	—	—	—	—	No experiments fell in this series
Arrah	56.775(8)	20.63(8)	444.67(15)	142.6(15)	
Akhagaon	—	—	—	—	do.
Behea	—	—	—	—	do.
Piro	397.10(49)	230.2(49)	460.23(43)	141.40(43)	—
Karghar	588.29(38)	465.5(38)	453.25(40)	309.5(40)	
Dehri	631.0(10)	701.00(10)	520.0(4)	300.0(4)	
Pajraon	—	—	—	—	do.
Kishunpur	528.09(10)	480.0(10)	640.0(2)	560.0(2)	
Chainpur	455.0(10)	141.67(6)	240.0(10)	172.0(10)	

The figures in the brackets indicate the number of experiments

In the case of wheat, the Kishunpur Series gave the maximum response of 640·0 pounds per acre, but the conclusion may be flexible as it is based on the results of two experiments only. Next comes the Dehri Series with 520·0 pounds per acre, but here also the conclusion may not be correct as it is based on the data of four experiments only. This is followed by the Piro, Karghar and Arrah Series which have a low level of response (460·2 pounds, 543·3 pounds and 444·7 pounds per acre, respectively). The least response (240·0 pounds per acre) is found in the Chainpur Series.

Response to nitrogen. The highest response on paddy was observed in the Dehri Series (631·0 pounds per acre) followed by the Karghar, Arrah and Kishunpur Series which gave responses of 588·2 pounds, 567·5 pounds and 528·0 pounds per acre, respectively. The Chainpur and Piro Series which followed next gave responses almost on the same level, being 455·0 pounds and 397·10 pounds per acre, respectively.

Response to phosphoric acid. In the case of paddy, the maximum response has been obtained in the Dehri Series (701·0 pounds per acre) followed by the Kishunpur and Karghar Series giving almost similar responses of 480·0 pounds and 467·5 pounds per acre, respectively. Next in order comes the Piro Series giving an average response of 230·2 pounds per acre and the Chainpur Series giving a response of 141·7 pounds per acre. The

Arrah Series, however, has given a negative response of 20·6 pounds per acre.

In the case of wheat, the highest response is obtained in the Kishunpur Series (560·0 pounds per acre), but here also the data are very meagre to arrive at a definite conclusion. The Karghar and Dehri Series are at par with each other, giving a response of 309·5 pounds and 300·0 pounds per acre, respectively, whereas the Chainpur and Arrah Series which follow next gave a response of 172·0 pounds and 142·7 pounds per acre, respectively. The lowest response is observed in the Piro Series, being only 141·4 pounds per acre.

SOIL DESCRIPTION

Arrah. The soils of Arrah on which the manurial experiments were conducted varied from clay to sandy-loam on the surface, tending to be mostly lighter in the subsoil followed by heavier soils below in many cases. The surface soil was somewhat granular in structure, the compactness of the different layers depending on their texture. Profiles up to a depth of six feet indicated generally three to four layers. Concretions consisting mostly of calcium carbonate were observed generally in layers below two feet. At some places, blackish and brownish concretions of iron pyrites, sparsely populated, were also observed.

Dumraon. The soils of this area in the case of paddy experiments were found to vary between loam to clay in texture. In the case of wheat grown on uplands, sometimes a sandy to sandy-loam texture was also observed. In all the cases, the subsoils tended to be heavier downwards than the surface soils. Nearly three to four layers were observed up to a depth of six feet. The surface soil was generally granular in structure, the compactness depending on the texture of the soil. Concretions of calcium carbonate mixed with iron pyrites were generally observed in clayey layers.

Bikramganj. The surface soils of this area were generally sandy-loam to clay-loam in texture with porous and lighter subsoils. In some cases, heavier subsoils were also observed. The surface soil was granular in structure, but the subsoils were mostly structureless except in clayey layers where a nutty structure was observed. Throughout the profile, the presence of calcium carbonate and iron pyrite concretions was noticed which increased appreciably with the depth.

Sasaram. The surface soils of the experimental plots were generally loam to clay-loam, though in some cases sandy-loam textures were also observed which tended to be heavier downwards. Three to six layers were generally observed and the structure was mostly granular throughout the profile. Iron and lime concretions were observed at lower depths in sufficient quantities, but in well-drained soils they were absent up to a depth of six feet.

Bhabhua. The texture of these soils was clayey throughout the profile. Generally, three to four layers were observed and iron and lime concretions were found at lower depths.

From the chemical analysis, it has been seen that the soils of Shahabad district have a fair nitrogen and carbon content (0.059 to 0.069 per cent and 0.472 to 0.534 per cent, respectively, with more or less a balanced carbon/nitrogen ratio (8.75 to 12.78). The available phosphoric acid content of these soils is moderate to fair (0.039 to 0.0073 per cent), but the available potash content is generally low (not exceeding 0.04 per cent). The soils are generally saturated with calcium and magnesium, but the exchangeable potassium and sodium are negligibly small. This seems to have a marked influence on *p*H, as it rarely exceeded 7.5.

Three years' average responses in pounds per acre (treatment-wise and centre-wise) along with C.D. in respect of paddy and wheat are given in the table below.

The average responses to nitrogen in paddy and wheat are significant. The responses to phosphate are also significant in all the centres except Dumraon. The responses to nitrogen and phosphate are the highest in Sasaram in both paddy and wheat.

Paddy	*Central*	*40 pounds nitrogen*	*40 pounds nitrogen and 40 pounds phosphoric acid*	*40 pounds phosphoric acid*	*C.D. at per cent*
Paddy					
Arrah	1,796(24)	405	650	245	147.97
Dumraon	1,938(24)	412	508	96	216.59
Bikramganj	2,016(28)	514	1,004	490	303.01
Sasaram	1,669(28)	640	1,278	638	101.57
Bhabhua	1,017(28)	535	755	220	118.15
Wheat					
Arrah	564(27)	342	484	142	90.51
Dumraon	692(27)	512	558	46	70.75
Bikramganj	445(28)	381	655	274	70.68
Sasaram	799(28)	435	796	361	40.60
Bhabhua	443(28)	308	619	311	78 46

MY FIVE YEARS WITH BETTER METHODS

by

N. Palanivelu

TO make India self-sufficient in the Second Five Year Plan, it would be necessary to increase the existing food production by 40 per cent. In the Tanjore district of Madras State, where the main crop is paddy, the average production has been estimated at 1,200 pounds of rice per acre. A 40 per cent increase, therefore, would mean only an additional 480 pounds per acre.

I own a plot of 11 acres of wet land. The annual production of this land till 1952 was 24,000 pounds of paddy, and this was obtained by adopting the ordinary cultivation practices together with the use of chemical fertilizers (superphosphate). Even in 1952, the production was 3,000 pounds more than in the previous year.

From 1953, however, I began to follow the improved methods of cultivation recommended by the Madras Agriculture Department. Two acres were brought under a double crop of paddy and I used improved strains, discarding the varieties I was using before. I sowed less of paddy in separate nursery plots; as a result, I saved 45 pounds of paddy seed per acre. After taking into account all the expenditure on the extra manures, there was a net increase of 3,600 pounds of paddy. Encouraged by this, I decided to secure a production of 36,000 pounds in the following year. Accordingly, green manure was cultivated in all the land.

In 1954, I brought six acres under a double crop of paddy and, in that year, I secured a production increase of 8,400 pounds. During the same year, I planted *P. 216 F* cotton and along with it grew vegetables in a plot of 50 cents during the fallow period in the summer. This gave me an additional income of Rs. 250. On the rest of the land, I grew the green manure crop of *Sesbania speciosa.*

In 1955, I put one more acre under the two-crop system and devoted more attention to the cultivation methods. I applied 6,000 pounds of *Sesbania* per acre as green manure, and intercultured all the land thrice. Steps were also taken against insect pests. During that year, there was an additional increase of 9,000 pounds.

In 1956, all the land was brought under the two-crop system. In the first crop, there was a yield of 26,400 pounds of paddy, at 2,400 pounds per acre, and in the second crop, 24,600 pounds, or an average of 2,220 pounds, per acre. Thus, there was a total yield of 51,000 pounds in that year.

During the last year, i.e., in the fifth year of my experiment, all the 11 acres were put under the two-crop system. As against 112 pounds of superphosphate that was being applied to the land during the last four years, I applied 150 pounds of it. In addition, 5,000 pounds of *Sesbania* per acre were used. Also, some of the urine-soaked soil from the cattle-shed was sprinkled on the land. The yield of the first crop was 32,300 pounds, i.e., an average of 2,940 pounds per acre.

However, heavy rains greatly affected the second crop. With steps against insects, there was a production of 22,440 pounds, or an average of 2,040 pounds per acre. The total yield of 42,780 pounds was 3,780 pounds higher than the previous year's production.

I feel proud of my land's increased production and of my own small contribution to the country's food resources. I trust that other cultivators would similarly adopt the latest methods of agriculture and benefit themselves and the country at large.

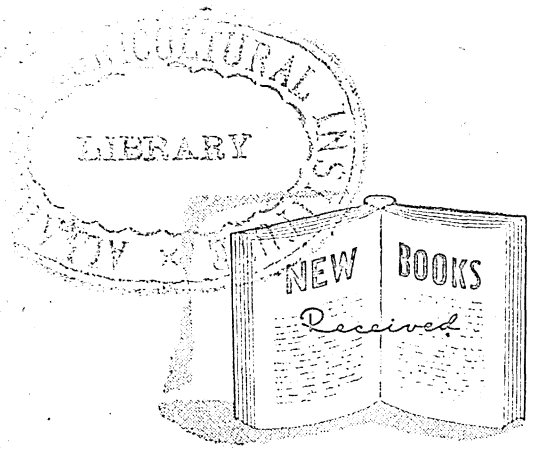
ALL-INDIA CATTLE AND POULTRY SHOW

An All-India Cattle and Poultry Show will be held at Bangalore from February 22 to March 1, 1959.

An All-India Cattle and Poultry Breeders' Conference will also be held on that occasion.

Sponsored by the All-India Cattle Show Committee, the Show will display improved breeds of cattle, buffaloes, horses, sheep, goats and poultry. An agricultural exhibition in which some of the foreign countries are participating will form part of the Show.

A feature of the Show will be the organization of competitions for milk yield, draught capacity, Krah and ploughing capacity, besides horse and bullock-cart races.



Food Administration in Punjab and U.P. 1946-53

by P.K. Mukherjee and Kissen Kanungo

Published by the Agricultural Economics Research Section, The Delhi School of Economics, University of Delhi, Delhi-8; price Rs. 5.00; sole distributors Atma Ram & Sons, Kashmere Gate, Delhi-6.

South Asia Social Science Abstracts 1957

Social Science Bibliography India, Pakistan 1957, No. 6

Published by the UNESCO Research Centre on the Social Implications of Industrialization in Southern Asia, P.O. Box 242, Calcutta.

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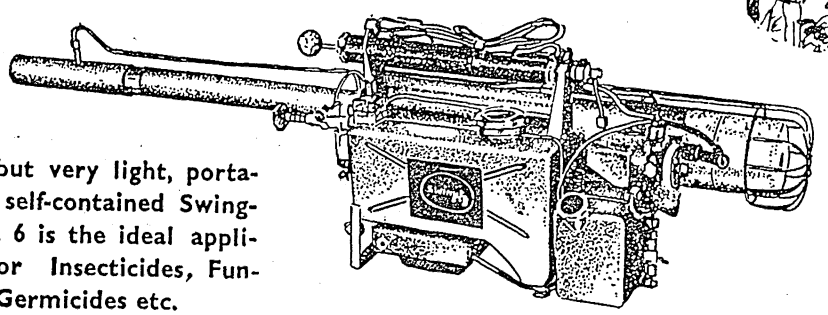
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WHAT'S NEW IN FARMING

PICKING AND PACKING COTTON

MOST farmers do not obtain a good price for their cotton in the market. Why so ?

A good price or a poor one very much depends on how clean you pick and pack your cotton. Farmers should develop " clean habits " in handling their cotton; then they will get more profits from their produce.

When cotton bolls burst, pick your cotton with care. No dry leaves or



other foreign matter should get mixed with it.

Dry the picked cotton in the open, clean the *kapas* to separate all insect-damaged locks.

Ask the gin-owner to clean the gin before putting in your cotton. Insist on getting back the seed and lint separately. And, see that your lot is not mixed with others'.

Still more important: if you grow both *desi* and American cottons, have them picked, ginned and pressed separately. If you mix a good cotton with an inferior one, you will get the price of the inferior one for both.

Don't ever try watering or adding foreign matter for getting more for your cotton, for then you are sure to lose.

IMPROVING POULTRY

MAYBE the process is a little slow, but crossing the males of the improved poultry breeds with *desi* females is a good method of improving poultry, especially in our villages.

For this, males of the White Leghorn or the Rhode Island Red breed could be used. Compared with the *desi* birds, these breeds give more and bigger eggs.

By using these breeds for crossing with your *desi* hens, you " grade up " your flock.

The cross-bred chickens have better livability ; they do not lose the setting and brooding habits of the *desi* mother. So also they get the instinct of protecting themselves from their natural enemies.

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DURING the summer months, palms exposed to the hot sun develop dark patches, especially on the south-western side. The stems get cracked, and wood-rotting fungi enter. On a windy day, especially during the monsoon, such stems break.

To get over this problem, leafy trees should be grown on the south-western side of the plantation, and the stems of unaffected palms protected with areca leaf-sheaths.

If a few of the trees have been damaged already, split pieces of areca stems should be tied around the stems of such trees. This will protect them against heavy winds.

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THE earlier a pullet starts laying eggs, the better always will be her total annual egg production. This is the opinion of the poultry experts at the Izatnagar Veterinary Research Institute.

Another finding at the Institute which will be of interest to all poultry-keepers is: to have good-sized eggs, the breeding stock, especially the females, should be selected with consideration to their body-weight. A 24-week old White Leghorn pullet should weigh 3½ pounds and a Rhode Island Red one, 4½ pounds. Such birds usually lay standard size eggs, a dozen of them weighing 24 ounces or more.

For those in the table egg business, here is another useful hint from Izatnagar: it is economical to keep Rhode Island Red and White Leghorn birds only for ten to 12 months from the time they laid their first egg, because in the second year the number of eggs laid goes down by a fifth.

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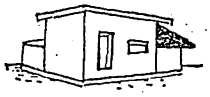




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THIRTY chicks and sixty eggs of the White Leghorn breed: this is what started Shri Rambhau Kharat of village Sonake in Bombay State on the road to prosperity in 1940.

"Till then all I did was to struggle with my six barren acres and thirty poultry birds of a nondescript breed to make both ends meet," said Kharat, whose farm I visited recently. Today, thanks to his switch-over to White Leghorns, he has 73 acres of cultivable land and a poultry flock that brings him a comfortable 1,200 rupees a year. There was quite a setback to his flock a few years ago, I was told, due to Ranikhet and a severe famine, but he was slowly making up.



Kharat has bagged the shield for the best poultry breeder of the tract for the last six years. He wins a number of cash prizes every year in poultry shows held in the State, and "I consider the Rs. 300 to 400 made in this way also a return from my flock," he put in good-humouredly. With a little touch of pride he added that his eggs and birds reached every corner of Maharashtra and Karnatak.

The Kharat farm is situated along the banks of the village stream, "the holy Ganges of my birds," as Kharat likes to call it. He has planted a grove of *nim*, *babul* and *pipal* trees on the farm. The birds, therefore, have cool shade all around them.

Besides the usual *jowar* or maize, Kharat feeds his birds with onions, and dry fish at least once a week. In summer, he gives them *methi* CONTD. ON PAGE 40

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CONTINUED FROM PAGE 23 **FARMING ELSEWHERE**

daily rise of 2°F up to 68°F as the mean temperature. The eggs are left for about 12 days with the humidity kept at 72 to 75 per cent, and at 75 to 80 per cent on the approach of hatching. Apparently, it is drier in the earlier stage of embryonic development and more moist in the later.

Introducing. Hatching usually takes place at dawn. In spring, it occurs precisely between 7 and 8 a.m. and in autumn, 6 and 7 a.m. For this reason, the time for introducing caterpillars to a tree is generally before 10 o'clock in the morning. It is very inadvisable to introduce them when the temperature in the cocoonery is low. No introducing should be initiated unless the weather is getting warm.

The caterpillars are extremely active. When hatched, they are led to the tree by means of a twig of willow or cedar, five to six inches in length, which serves as an introducer. In introducing, a bamboo wattle or millet straw is lightly laid over the egg-card of tin foil upon which the twig is put. As soon as the larvae come in touch with the leaves of the twig, they are gently transferred into the tray together with the twig. Other fresh twigs are used in succession to mount them on the tree. In case of rain during hatching, the twigs to which the worms are clinging are cut with scissors and put into jars or bottles of water where the worms are reared indoors temporarily. Should the weather permit and the wet leaves dry up, they are sent out to the cocoonery for rearing again.

In Liaoning and Shantung, autumn tasar silkworms are generally hatched and reared in the early and middle parts of August. The method for cultivating the autumn stock differs from that for the spring stock. In the middle of July, the emerged female moths are attached directly to the twigs for the purpose of mating, laying, hatching and feeding on the host plant. The number to be colonized is determined by the food available. As a rule, it is greater in the spring than in the autumn. Usually, a batch of eggs from a single female moth may be fed on ten trees.

Cultural management. *Density of colony.* As the tasar trees vary in age and condition of growth, the number of worms to be fed per tree depends on its size and density of leaves. Generally speaking, a medium-sized tree two or three years old may be used to feed a group of 60 to 80 caterpillars. Caterpillars after the second instar should gradually be thinned out to not more than 30 to 40 to a cocoonery which was provided inclusively for the stock in the second instar up to the fifth molt.

The foregoing limit of colony is mentioned only for reference. For practical purposes, it is varied in regard to the local conditions and development of the native individual trees.

Trimming and transfer. This is a special practice in rearing tasar silkworms. When a mature leaf grows stale or is exhausted, or its quality is poor, the caterpillars are to be transferred to fresh foliage. The time of transfer is preferably before 10 o'clock in the morning when the dew is over and the temperature is not high, or after four or five in the afternoon. No transfer of caterpillars should be done at noon, as the high temperature will necessarily affect the physiology of the stock.

The frequency of transfer is varied in different localities and determined by existing local conditions. In the spring, during their younger stage the caterpillars are generally transferred once an instar, i.e., prior to the first, second, third and fourth instars, and at the fifth molt when their appetite is good, transfer should be made respectively. Caterpillars when fully developed must be transferred to the cocoonery. Sometimes, a supernumerary transfer is required in the adult stage. But too many transfers would inevitably cause a decrease in the number of caterpillars. Proper observation is specially important, since the percentage of cocoons otherwise would be reduced.

Setting caterpillars. This refers to transferring caterpillars from an old tree to a fresh one. The number of caterpillars to be set is governed by the sizes of the tree and the density of its leaves. Definite technique in handling is necessary. In setting, both ends of the old twig should be closely attached to the fresh one in a criss-cross position. When the wind blows, the old twig should be placed in the centre of the tree. The distribution should be made as evenly as possible. The old twig should be left on the fresh one for about half a day. After all the caterpillars have found their way to the fresh leaves, the old twigs must be removed promptly so that proper ventilation may be provided and pests controlled.

Management and protection. During their young stage, special care must be taken to protect the caterpillars from wind and rain. The cocoonery should be sheltered from the wind, and the twigs bundled up so as to prevent the wind from moving individual caterpillars away from the tree. The most proper way of cultivating tasar silkworms is to feed those in the first instar indoors, then transfer them to the cocoonery as the second instar takes place. This protects them from getting lost.

To protect the caterpillars against epidemic diseases and enemies, it is of primary importance to pay

particular attention to the selection of the cocoonery, to feed the caterpillars carefully and to distribute them very thinly. Moreover, precaution must be taken to keep the tree clean, to see that faeces fall to the ground, to eliminate pests, and to reduce the chances of epidemics. If an occasional caterpillar does get sick or dies, it should be burned immediately together with the twig to which it is attached.

To safeguard the caterpillars from epidemic diseases and enemies, it is desirable to keep the cocoonery thoroughly clean. It is best to spray insecticide before setting caterpillars so that enemies, if any, may be destroyed. Caterpillars when mounted should be thoroughly protected. Pests of any kind must be caught and birds driven away. It is imperative that the loss of caterpillars be minimized in every possible way to insure satisfactory output.

Spinning and collecting of cocoons. The cocoonery selected for spinning must be a tree that affords an abundance of leaves and perfect ventilation. Of the utmost importance in rearing caterpillars is to keep track of the stages of their development. There are disadvantages from transfers which are too early or too late as well as from overcrowding or too sparse distribution of the caterpillars.

The most appropriate time to collect cocoons is about seven days after spinning. Efforts have to be made to enable some cocoons to spin earlier and others later to facilitate collection. The preferable time for collecting is early in the morning 8 to 10 a.m. and after 3 o'clock in the afternoon. At these times, the weather should be fine. Cocoons collected must be taken to the nursery outright. The best ones are selected as breeding stock and the remainder is marketed.

Protection of breeding stock. The overwintered breeding stock of the univoltine is called the spring stock and that of the bivoltine, autumn stock. Upon arrival at the nursery the twigs with cocoons are shaken out. When dried, leaves are stripped off and imperfect cocoons, both fragile and rotten, are picked out. The hibernated bivoltine are then placed in the containers, between 1,500 to 2,000 cocoons in each. Cocoons for breeding purposes are lightly dispersed on racks, two to three feet from the floor, and kept in a clean place. They should be turned over occasionally so as to prevent them from overheating. In the Yangtze Delta, they pass into the pupal stage under natural temperature until early December. The constant temperature for protecting the hibernates is preferably 0°C. It should be heated up to 0°C when below -5°C. The hibernated univoltine are gathered at the end of summer and in the beginning of autumn, when the temperature is very high; so the adjustment of both temperature and humidity is of the first importance. After autumn, they are to be protected in the same manner as the bivoltine.

Breeding. As has been mentioned above, some tasar silkworms are single brooded or univoltine, others bivoltine, or occasionally tetravoltine. Breeding in spring is performed by warming the hibernated stock of the previous year in a warm room in early or late February to accelerate pupal and moth development. The increase of temperature depends upon the natural temperature at the time. Ordinarily, the starting point begins at 58°F with a rise of 1°F every other day. After two weeks, an increase of 1°F daily till 68°F, with humidity 70 to 75 per cent, is reached. This is held as the mean temperature till emergence occurs. The length of time taken for emergence is approximately one month in Kiangsu localities and about 40 days in Shantung and the North-east.

The male moths are primarily selected soon after emergence from the cocoons and at the time when their wings have spread and become hard. Sound males are selected and put into trays with covers, each containing about 120 moths, and placed in the region where the temperature is relatively low. Then the female moths are captured. As soon as the wings of the females have sufficiently expanded, the act of mating takes place at night (between 11 and 12). The mates are to be segregated around 3 p.m. the following day. The coupling lasts approximately 12 to 16 hours. Subsequently, the selection of female moths is made by a naked eye examination, known as "selection of segregated pairs." This process is rather strict and requires certain training. The general criterion is: both wings fully-scaled and neatly formed, abdomen swelled though barely discernible, segments conspicuous but not corpulent and with no dark brown spots, and eggs plump in shape. Such a female moth may be kept for breeding purposes.

After the female moths are selected, they begin to lay eggs. One way is to set the females in satchels so that the moths can be microscopically examined readily; eggs deposited by the diseased ones can be removed and epidemics controlled. Eggs collected in this manner are, for the most part, stored as breeding stock. The other method is to have the females scatter eggs for general rearing purposes on sheets of paper.

In the first case, the satchel is made of kraft paper or newspaper in the form of an envelope ten to 12 c. On either side of the envelope, several small holes are made for ventilation purposes. The moths are placed in folded and sealed envelopes which are strung together and hung up for oviposition.

In the other case, the female moths are distributed to lay eggs in a round bamboo basket, 12 c. high and 40 c. wide. It holds a 100 moths. The temperature for egg-laying is best at 68 to 70°F, with humidity 75 per cent. When laying is complete, the eggs are stripped off the basket, and such dirt as hair and urine sticking to the eggs is washed off with clean water. Then they are immersed in a solution of two per cent formalin for disinfection. The temperature of the solution is 68°F. Having been immersed for 30 minutes, the eggs are taken out and bathed again in pure water until no smell of formalin is detected. Then they are dried on tin foil, packed into egg-boxes, kept in low temperature until they are to be incubated 12 to 14 days before the leaves of the tasar trees sprout.

BIOLOGICAL CHARACTERISTICS

The most important biological characteristic of the tasar silkworm is its voltinism. This species is univoltine, bivoltine and tetravoltine as a result of its easy assimilation with environmental conditions. So far as the distribution of the producing areas in China is concerned, the race reared in such provinces as Kweichow, Szechwan and Honan is univoltine, while that in Shantung and Liaoning is bivoltine. Suppose the bivoltine of Shantung and Liaoning were transferred to Honan and Kweichow, part of their descendants would become univoltine. On the other hand, if the univoltine raised in Honan and Kweichow were transferred to Shantung and Liaoning, the bivoltine would likewise occur.

What affects the voltinism in tasar silkworms has not yet been scientifically established. Professor Koo Chin-hung, the celebrated sericulturist of China, made a profound study of voltinism of the tasar silkworm in 1941. He ascertained that the variation of voltinism in this species is due both to the length and the duration of sunlight to which the silkworms are exposed at the given moment. It is obvious that the duration of natural light affects particularly the fourth and the fifth instar caterpillars. A number of Soviet sericulturists also have tackled the problem of voltinism. The studies made by Andrenova, Penichi, Denilifsky and Belov also show the specific effect on the voltinism in this species of the photoperiod, i.e., duration of daily exposure to light.

The most significant study on the effect of photoperiod on the tasar voltinism has been carried out by Belov. He has arrived at the conclusion that if the amount of exposure to natural light is less than 13 hours, the caterpillars will develop into dormant pupae without undergoing another larval molt, thus producing univoltine. On the other hand, caterpillars exposed to natural light for 14 to 15 hours will be induced to become restless pupae with a further molt, thus producing bivoltine. This confirmed Professor Koo's conclusion: "As the time of rearing tasar silkworms in Liaoning and Shantung is just around the summer solstice, the day is long and the sunlight strong, thus resulting in the bivoltine. In Honan and Kweichow, the climate is warmer than that in the northern part of China; hatching occurs earlier and the day is short, the fourth and fifth molts take place in the middle of May or about three weeks from the summer solstice, thus bringing about the univoltine."

This point is confirmed by Belov. He indicated that in summer and autumn, if the length of exposure to natural light is prolonged one day, the pupal stage of the second generation in autumn may disappear. In other words, the original bivoltine may be induced to become tetravoltine by taking a longer exposure to natural light. Such artificial and purposeful transformation has been made by the Sericultural Institute. In 1955, the Institute exposed late autumn silkworms to natural light for 18 hours. As a result, all of them become pupae without hibernation (tetravoltine), while those hatched under ordinary conditions are all resting pupae (bivoltine). This proved Belov's conclusion.

In addition to the effect of exposure to natural light, the other important environmental factors that act directly on voltinism are temperature, humidity and feed.

In short, voltinism of the tasar silkworms is inconstant and is readily affected by environmental factors, typically the photoperiod. Nevertheless, the way to control voltinism has not yet been solved thoroughly and awaits further study. This is the most vital problem for production and is a worthy and urgent task in the field of biological research.

CONTINUED FROM PAGE 36

FARMERS I HAVE MET

leaves, green onions and coriander at least twice a week. To avoid excessive inbreeding and to introduce fresh blood into the flock, Kharat occasionally imports eggs and cockerels from other good farms of the area.

A constant companion of Kharat's poultry birds is a family of one male and four female guinea-fowls. "They are valuable chaperons of my birds. In case an intruder like an eagle, mongoose, cat or wolf attacks the flock, they bring the whole farm down with their loud cackling till one of us runs down and drives the menace away," he added, laughing.

—G.D.B.

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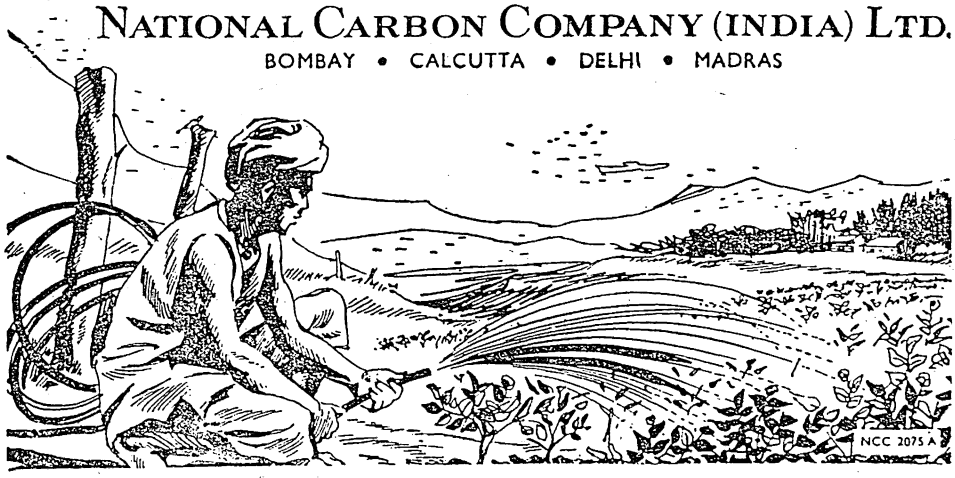
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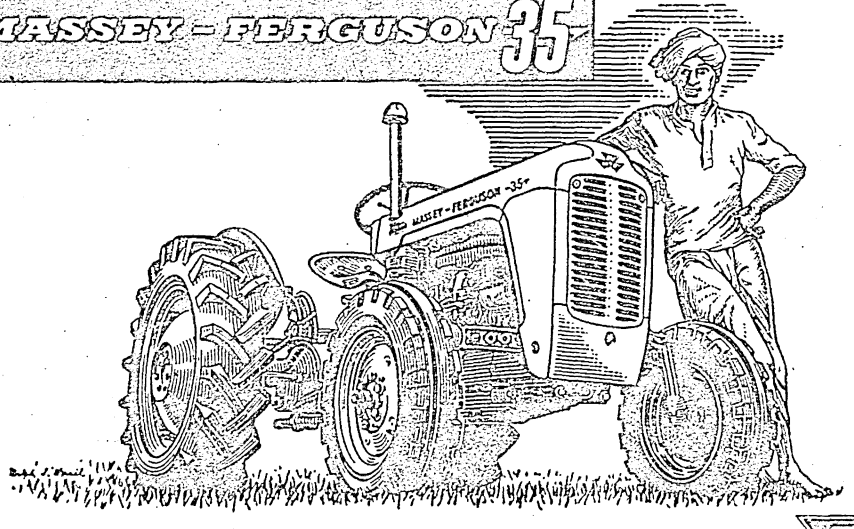
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The end of the world

'THAT,' thought the hare, 'must surely be the Earth crumbling to pieces.' He had heard the thud of a fruit falling on dry leaves. 'I must run to save my life,' he mused.

He ran so fast that a deer, grazing in the fields, asked him, 'Why all this haste, brother?'

'Don't you know that the Earth is falling apart?' panted the hare. 'Save yourself! Follow me!'

The deer raced after him.

And soon they were joined
by a buffalo, a wild ox,
a rhinoceros, a tiger,
an elephant and even a lion.
In fact, the whole animal
world followed them in a great procession.

They thundered on for miles—until they were tired. Then the elephant began to wonder why there were no more signs of the Earth's collapse. So he asked the tiger: 'Brother Tiger, are you sure that the Earth is breaking up?'

The tiger stopped. 'Well, so the rhinoceros informs me,' he said.

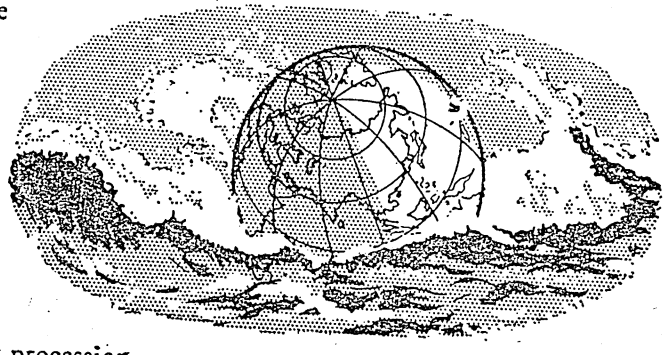
'I'm not sure,' cried the rhinoceros. 'Only, the wild ox tells me so.'

The wild ox bellowed: 'Don't blame me! I only repeat what the buffalo said.'

The buffalo pointed to the deer; and the deer mumbled: 'The hare started the story.'

The elephant trumpeted for the hare and asked: 'Well, Mr. Hare, who told you that the Earth was collapsing?'

'Nobody need tell *me*,' said the hare importantly. 'I knew as soon as I heard a sound like a thud. I thought it was certainly the end of the world.'



'You *thought* so,' laughed the elephant. And all the other animals went off, roaring with laughter.

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OUR COVER



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Indian Farming

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Editor: **Harkirat Singh**

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NEW DELHI

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Grandpa always told me it was impolite to ask questions (*said Tata*).

But to find something out (*said Fison*) one has to be a bit nosey!

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So if we make it our business to ask a few questions (*said Fison*), don't think us rude...

It's all in your own interest (*said Tata*).

And ours too, of course!

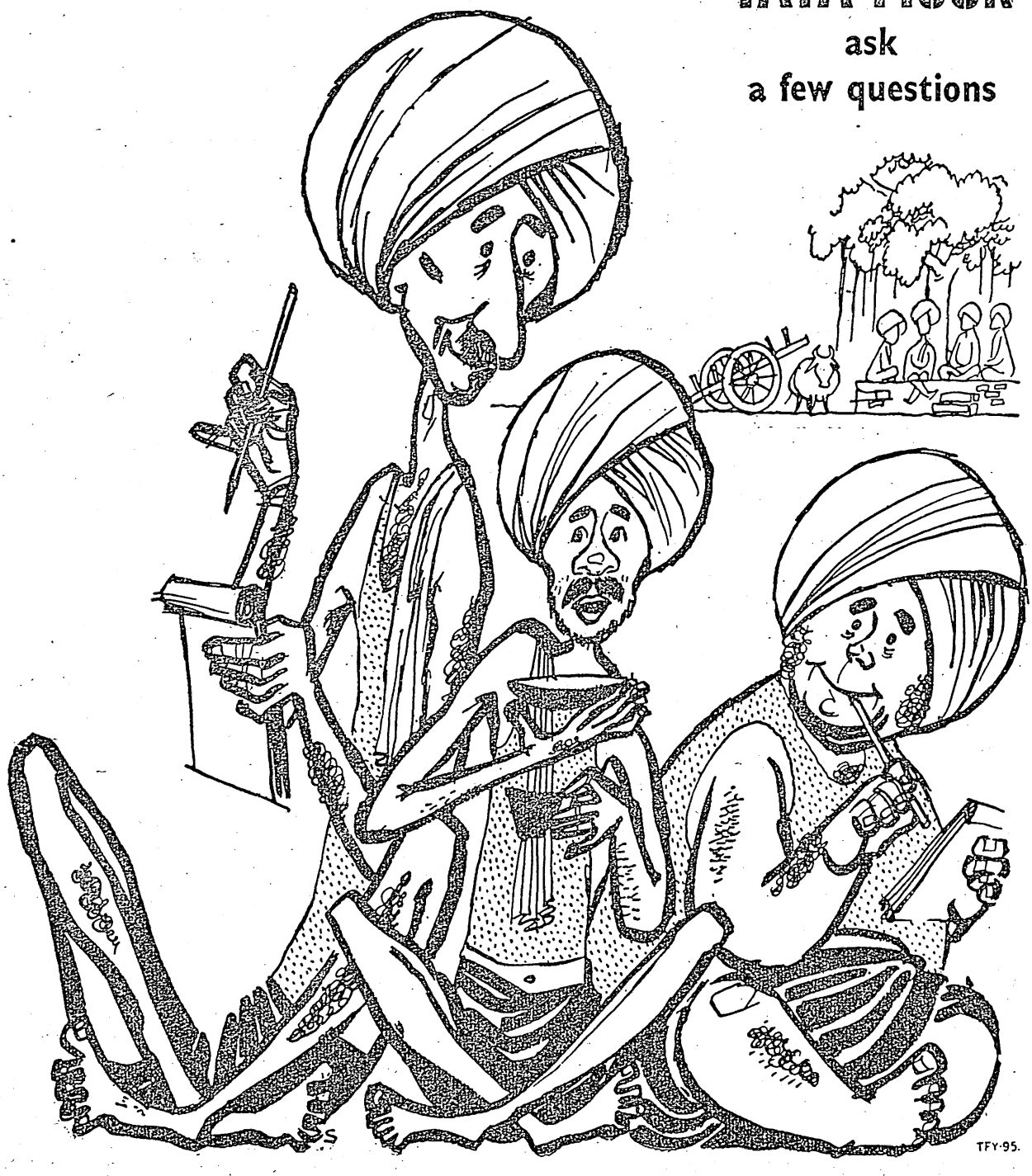
P.S. *The science of asking questions is Market Research, and it has solved many consumer problems. It could tell you, for instance, why gentlemen prefer blondes or why blondes prefer gentlemen—if you're interested in that sort of thing! Tata-Fison, the largest formulators and distributors of pesticides in India, believe very strongly in Market Research. Can't do enough of it (they say).*

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ask

a few questions



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editor's page



MIXED FARMING

THERE should be no two opinions about the fact that the mixed farming system suits our small holdings best. Mixed farming, as understood in India, is a complementary use of livestock and crops to get the maximum out of both. Its ultimate aim is a self-sufficient unit where all the primary needs of the rural family will be met. This is achieved by growing food and cash crops, rearing dairy stock over and above the work-animals, introducing suitable forage crops in the cropping scheme and making an optimal use of cattle manure and other farm wastes.

The advantages are quite clear: an intensive use of the land is made; the fertility of the land improves due to the growing of leguminous and other fodders and the extra manure obtained from the cattle; by-products of crops and the natural growth of local grasses during the monsoon months are profitably utilized by animals; the milch cattle not only provide a wholesome diet to the family but also supplement its income; the farmer can have animals from his milch stock for cultivation without investing any capital from his pocket; the dry stock is not a burden. To ensure a full use of the entire farmyard manure, fuel and fodder trees such as *babul* and *shisham* may be grown on the sides of the roads, field boundaries, etc.

Mixed farming, in fact, is not something new to our farmer. But, he practises it merely as a tradition handed down to him by his ancestors. To enjoy the benefits of mixed farming to the maximum extent, however, he has to develop a strictly business outlook. If he maintains cows which have long dry periods and do not yield much of milk, for sentimental reasons, he is losing sight of economic considerations. The mere manure from them cannot pay for their upkeep.

That is why prosperous "mixed" farmers attribute their success to: keeping only as many animals as can be conveniently maintained without the need to purchase food and fodder from the market, selecting a more economic animal, purchasing a bullock rather than rearing one if it is uneconomic to do so and disposing of calves immediately after the weaning stage, feeding the animals in stalls except in the three monsoon months to get every bit of manure from them, disposing of the animals before they get too old, and sending bullocks to *pinjrapoles* and paying the necessary fees instead of feeding them at home.

The economy of a mixed farming unit may be further reinforced by maintaining sheep, goats, pigs and poultry. Where water reservoirs, tanks or ponds are available on the farm, fish rearing may be practised. The spare time of the members of the household will thus be profitably spent, and in times of stress the subsidiary occupations will stand in good stead to the family.

Man of the Month



A crop of *N. P. 822* wheat that promises a big harvest

42 Maunds of Wheat Where One Grew Before

by

Harkirat Singh

TAKING crops out of an "unwilling" land may be a difficult task for an ordinary farmer, but not for Shri Kesar Singh ; he is slowly making some 27 "poor" acres bear "rich" crops for him. Shri Kesar Singh, whose farm I visited last month, belongs to the Garden Colony of Panchi Gujran in Rohtak district of the Punjab. This land has been allotted to him in lieu of ancestral property left by him in West Pakistan.

Not that Shri Kesar Singh has been a farmer throughout his life. He took to this "interesting vocation," as he calls it, only after retirement from Government service. There was disappointment in store for him though when his first attempt in 1950 brought him a mixed wheat-gram yield of a maund and ten seers only.

This, however, did not damp his ardour. He resolved to discover and remove the cause of this low yield. He got his soil analysed by the Government Soil Chemist, "and his report," Shri Kesar Singh beamed, "was what actually showed me the way." It read : "The soil ....seems to be a poor one. The *ph* being more than 8.0, the soil shows a tendency towards alkalinity. The

essential plant-food ingredients are lacking. There being no *kankar*, etc. throughout, the soil can be improved and kept fit by a regular and copious supply of water, organic matter, nitrogenous and phosphatic fertilizers. Green manuring if resorted to will have great beneficial effect towards binding the soil."

PRACTICAL PLAN

Keeping these points in view, he soon set about drawing up a practical plan for his next wheat crop. "I gathered a good deal of agricultural literature, and also contacted agricultural officials," Shri Kesar Singh told me. This is the programme he finally worked out: first of all, drilling superphosphate at a maund to the acre; then sowing *guara* and burying it when three to four feet high; then giving the land three to four ploughings, an equal number of *sohagas* and the *rauni* irrigation; then drilling a maund of superphosphate and a maund of ammonium sulphate to the acre; then drilling wheat in lines by using a seed-rate of a maund per acre ; irrigations depending upon the need of the crop, generally four; one hoeing after the first watering.

Success came, and the yield began increasing from year to year. In 1957, it stood at 42 maunds 22 seers per acre !

CERTAIN CHANGES

Now when the land has "got into the habit of giving good yields" he has made certain alterations in his method a maund of superphosphate at the time of burying the *guara* and not at the time of sowing it ; 20 seers of superphosphate and 20 seers of calcium nitrate at the first watering ; 20 to 30 seers of calcium nitrate again at flowering "if the crop does not seem to be coming up to my expectations."

Shri Kesar Singh grows only *N.P.* wheats. "My farm being nearer to Delhi, they seem to do specially well here," he is of the opinion. As soon as he notices any deficiency in a variety, he at once changes to a better one. While he has also grown *N.P. 718*, *N.P. 760* and *N.P. 770*, these days he prefers *N.P. 822* and *N.P. 824*. "These are comparatively better-yielding, and non-lodging."

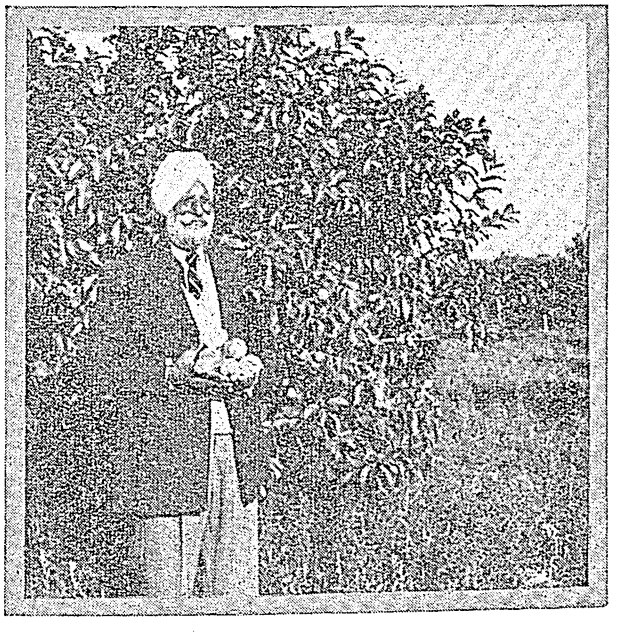
GUAVA ORCHARD

Since the Colony is primarily meant to be a Garden Colony, Shri Kesar Singh has set apart 13 acres for fruit trees. About 500 guava trees have come up well and 200 of them bore fruit for the first time this year after three years of planting; peaches, grapes and citrus are in his plan.

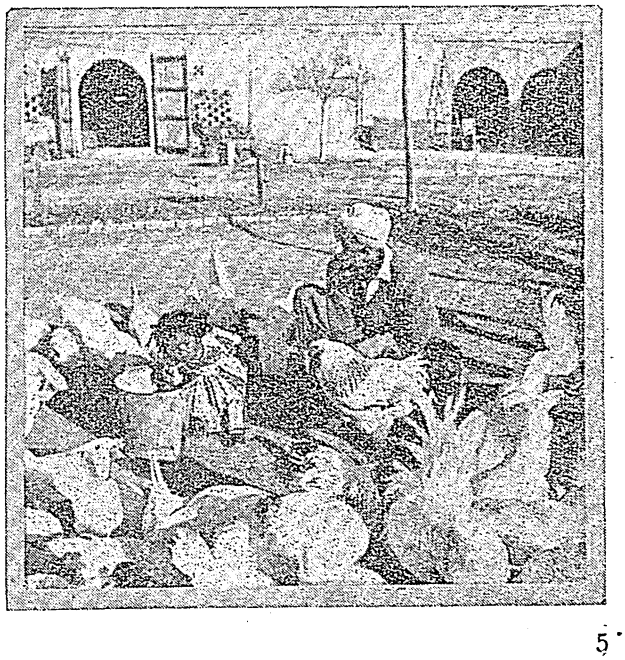
"Guavas are particularly suited for my soil," thinks Shri Kesar Singh. He, therefore, pays good attention to his guava orchard and wants to make it a lucrative proposition. He has decided to take only one heavy crop in winter, so he does not water the trees in March, April and May. "To conserve their vigour for the fruiting time," he will tell you. At the end of June, he gives each guava tree a maund of cattle manure plus a pound of ammonium sulphate or calcium nitrate.

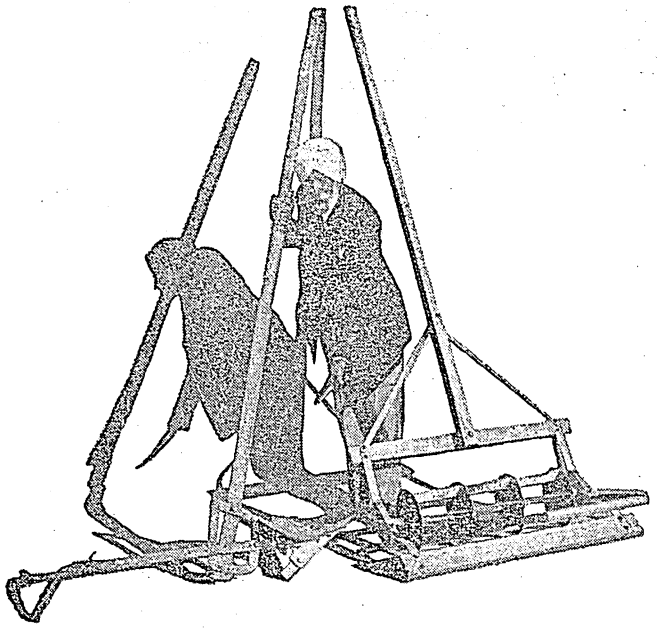
Shri Kesar Singh also has a passion for poultry-keeping. His 97-strong White Leghorn flock is very

In his guava orchard



Son Rajwant Singh is a great help in looking after the poultry





Shri Kesar Singh attributes his success in green manuring to two implements he possesses: the "Caretake" plough (*left*) and the green manure trampler (*right*)

well kept, and his 88 layers easily give him a daily egg-laying percentage of 40 to 45. A Light Sussex cock bred by him won the First Prize at the All-India Cattle and Poultry Show held in Delhi last year. "It all depends on the attention you give them," he says.

That the farmer would not waste any possible manure he could lay his hands upon was evident to me when he revealed that he would construct his new poultry cages over a portion of the irrigation channel near his tube-well. "Not only the birds will thus have cool comfort, but also their droppings will fall into the irrigation water and enrich my fields," he said.

Shri Kesar Singh also proposes to make use of a natural depression in his land by shaping it into a pond for rearing fish.

PLEASING FEATURE

A very pleasing feature of the Kesar Singh Farm is its rose hedges around the field borders—a total length of 2,600 feet. The variety used is *Bahari* from Choha Saidan Shah in West Pakistan. Apart from its being very thorny, another advantage of this variety is that the plants grow very tall and entangle themselves into an impenetrable wall.

"In April when they are in full bloom, my farm looks like a land of roses and the whole air is filled with sweet fragrance," Shri Kesar Singh tried to recreate the vision he is a witness to every year. "And since the flowering is very heavy and lasts for about 15 days only, I am thinking of utilizing the flowers, which are otherwise wasted, for distilling scent from them," he added.

The idea has caught on in the Colony and almost all the fields now have rose borders. Shri Kesar Singh was amused at my suggestion that they name it "Gulab Colony."

FIFTH NATIONAL CONVENTION OF FARMERS

Mysore will be the venue of the Fifth National Convention of Farmers to be held this year from May 1 to 5. It is expected that the Convention will be attended by over 3,000 farmer representatives from all parts of the country.

An Agriculture and Rural Industries Exhibition in which the various State Departments of Agriculture and other Committees and Organizations will participate, will also be held on the occasion. The Exhibition will depict the latest advances in agriculture in the country.

For further information please contact the Secretary, Farmers' Forum, India, Jawahar Lal Mansion, 3/15A, Ajmeri Gate Extension, New Delhi-1.

Two Reapers That Cut On Harvesting Costs

by

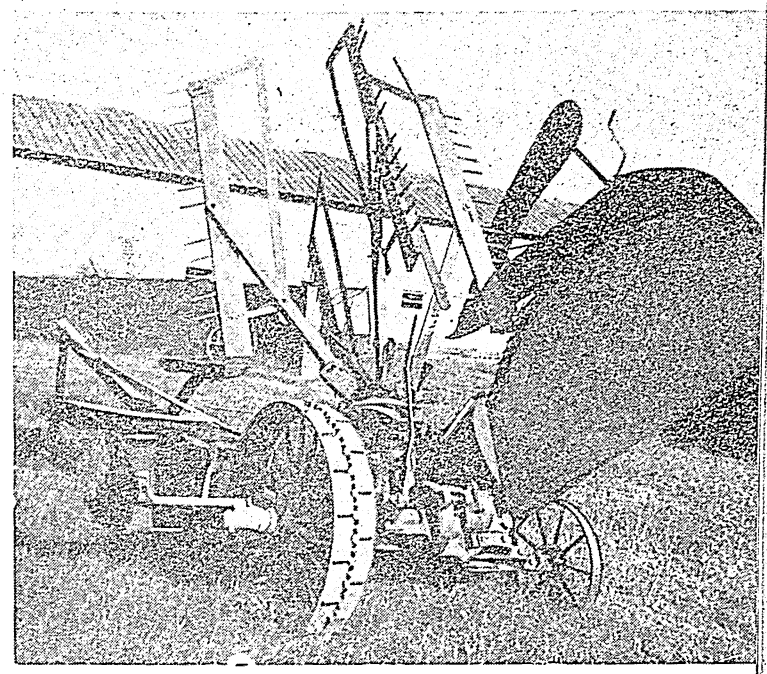
T. S. Mukherjee
Indian Agricultural Research Institute
New Delhi

IT has been found at the Indian Agricultural Research Institute, New Delhi, that for quick and economic harvesting of grain crops the horse-drawn reaping machines used in comparatively less mechanized countries can be conveniently adapted to our bullock-power.

One such machine is the bullock-drawn mowing machine used for cutting legumes and grasses. This machine has a 4½-foot cutter-bar. The machine has been slightly modified by fixing immediately behind the cutter-bar a buncher attachment made of wooden slats. This attachment has a hand-lever to raise or lower one end of it to collect the cut plants and deposit them in the field at intervals.

The bullock-drawn mowing machine in action in a wheat field





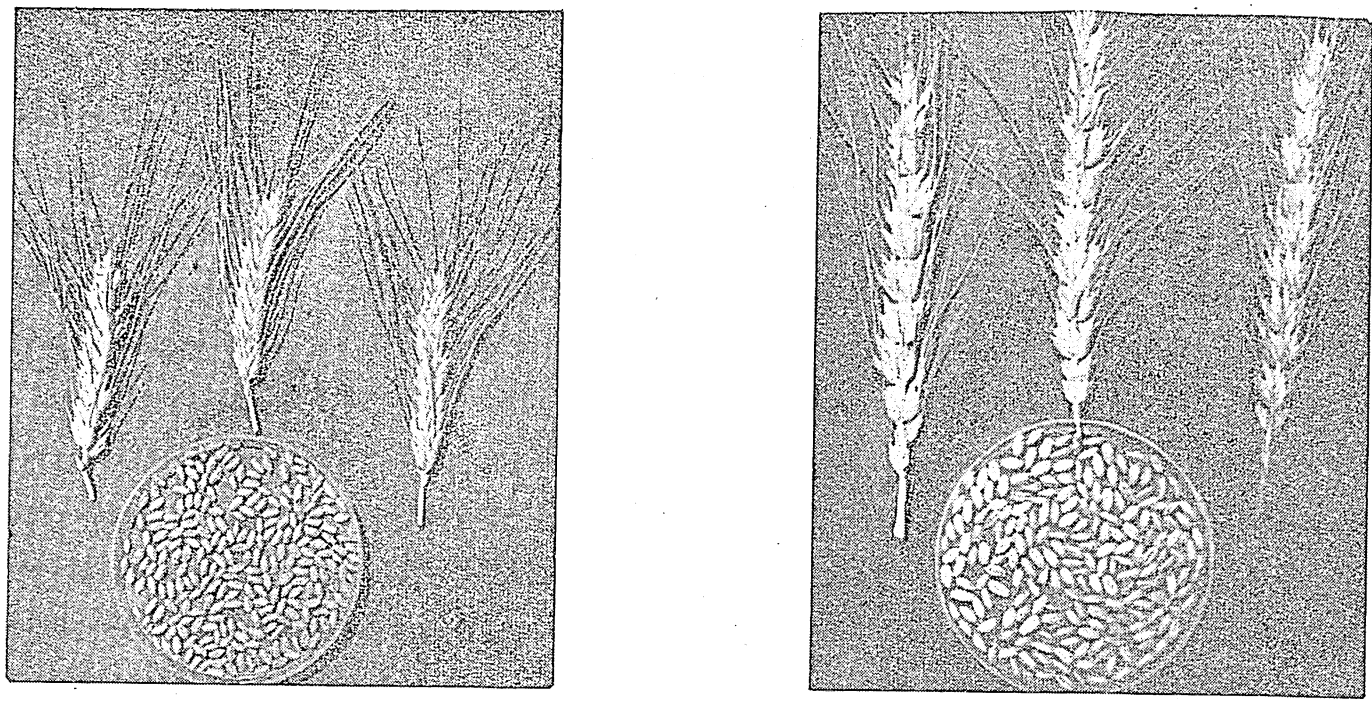
Better of the two is this self-delivery reaping machine. The platform has been raised and it is ready to be hauled to the field

With this machine, an acre of wheat can be harvested in 23·50 man-hours, in addition to 3·60 bullock-hours and 1·80 machine-hours. It was observed that it took five hours and 20 minutes for ten men, or 53 man-hours, to harvest the same area by the ordinary Indian sickle.

The main disadvantage of the machine, however, is that it requires a fairly large number of labourers at one time during the field operations. Of the 13 labourers engaged, three drive the machine and the buncher attachment, and the rest remove the cut plants to a side. This is necessary to prevent the harvested plants from getting trampled over by the bullocks in their next round. The same difficulty arises when a reaping attachment is used with a tractor. Such an attachment has another disadvantage: it cannot be conveniently used in small holdings.

SELF-DELIVERY REAPER

Better results were however obtained with a bullock-drawn, self-delivery reaping machine with a five-foot cutter-bar. This machine has a quarter-circle platform or collecting-board of steel plate; the cutter-bar is attached to its front. The harvested plants fall on to this platform and are swept off in heaps by the four rotating 'rakes' or 'sails'. They are deposited at a safe distance from the bullock-track, so the necessity of engaging labourers is eliminated. With a pair of bullocks and two men CONTINUED ON PAGE 11



Apart from being earlier in maturity, *C. 281* (*right*) has larger earheads, bolder grains than *C. 591* (*left*)

C. 281 Scores Over *C. 591*

by

Gurcharan Singh
Economic Botanist Cereals and Pulses, Punjab
Jullundur
and
Narsingh Dass Gupta
Incharge, Barley Research Farm
Gurgaon

A NEW strain, *C.281*, promises to solve the problem of low wheat yields in the Hissar, Gurgaon, Rohtak and Karnal districts of the Punjab.

This tract has about 25 per cent of the total wheat area in the State. The crop, however, is grown under conditions such as: meagre irrigation water, dry winter months, early warming up of the season, and fast and desiccating winds in March and April. *C.591* is the recommended variety for growing under irrigated conditions. This variety being mid-season in maturity, its grains do not get a chance to develop fully, shrivel up, and the yields remain low. That is why the necessity for breeding a strain which would mature earlier and escape these unfavourable conditions was felt.

A number of crosses between *C.591* and several early-ripening strains were attempted when the Regional Cereal Breeding Substation was started at Gurgaon in 1940. Of all the crosses obtained, *C.281*, a cross between *C.591* and *Pusa 4*, was found to be the most suitable.

C.281 possesses an erect and upright habit of growth, and at maturity is conspicuous by its slightly drooping earheads. It matures about a fortnight earlier than *C.591* if sown in the third or fourth week of October, which is the normal sowing time of wheat in these districts, and has bolder grains. In trials at many Government Farms for seven to eight years, *C.281* has outyielded *C.591* by an average 1.85 maunds per acre under normal-sown irrigated conditions.

Even under late-sown irrigated conditions, *C.281* has given a higher yield than *C.228*, so far recommended for such conditions, by an average 1.70 maunds per acre. This again goes in favour of *C.281*, as the farmer can utilize this variety both for normal and late sowings and

need not stock seeds of two varieties. This also saves a lot of confusion at sowing, harvesting and threshing.

C.281 has performed equally well on farmers' fields also. Extensive trials of this variety against *C.591* were undertaken in *chahi*, wet, and canal-irrigated areas of these districts. Of the 246 trials conducted in 1951-52, 1953-54 and 1954-55, *C.281* outyielded *C.591* in 173 trials by an average 0.10 to 3.50 maunds of grain per acre. However, the increase in yield of *C.281* over *C.591* during 1953-54 was comparatively less than in 1951-52 and 1954-55. This, because the season during 1953-54 remained unusually mild for a fairly long period, on which account *C.591* was at an advantage and the early-maturing character of *C.281* could not express itself. However, the combined results obtained during all the three years go in favour of *C.281* and are in close conformity with those obtained at Departmental Farms.

A crop of *C.281* nearing maturity. Note the slightly drooping earheads



* * * * *

TOO MUCH MILK IN JAPAN

Japan has a headache: surplus milk production. It figures 1958 production will hit 3.5 billion pounds, an all-time high and 17 per cent above last year.

Since the end of World War II, Japanese milk production has been increasing 16 to 20 per cent every year. While consumption also has increased, it has not kept pace with production. The Government is expected to soon launch a programme to discourage further production increase and to discourage dairy product imports.

—*World Farm News*

'SULPHAMEZATHINE'

5 GM. TABLETS

INFECTION of the cow's womb is common particularly when the delivery is difficult and manual removal of the calf is necessary. If this infection is neglected your cow may become sterile and bear no more calves. This means no more milk and the cow becomes a burden.

THIS loss can be prevented by inserting one or two 5 Gm. tablets of 'Sulphamezathine' into the cow's womb immediately after the calf is born. This keeps the womb clean and free from infection and protects your cow's health.

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Early planting and a good leaf-mulch

ENSURE TWO-FOLD GINGER YIELDS

by

K. Fazlullah Khan

Cashewnut and Spices Development Officer
Indian Council of Agricultural Research

BY paying attention to two things, farmers can easily double their ginger yields. They are: planting early in the planting season and applying a leaf-mulch to the beds. This is what results achieved under the Ginger Research Scheme at Wyanad go to show.

Ginger is a very remunerative crop, provided it does not suffer seriously from pests and diseases or adverse market developments. The grower quite realizes this and is generally inclined to take to ginger cultivation. But the one factor which deters him is the high cost involved. This also should no more be a problem to him, for he can now increase his ginger yields considerably.

Planting of ginger on the West Coast commences a little before the onset of the South-west Monsoon, which sets in in early May. Usually, the planting continues till the end of June. To determine the optimum time for planting ginger, four different plantings were done on 15th April, 1st May, 15th May and 1st June. The crop planted on 15th April recorded the maximum yield, double that obtained from the crop planted on 1st June.

Mulching of the ginger beds with green leaf is common in many parts of Kerala and Mysore States, particularly in areas where leaves can be readily procured. In the trials, application of green leaf at 20,000 pounds per acre was found to enhance the yield by 233 per cent.

THREE DOSES

The mulch was applied in three equal instalments. The first, immediately after planting the seed rhizomes in April, followed by the second and third applications timed according to the absorption of the first mulch. The rotting of the mulch and its absorption into the soil depends on several factors—rain, nature of the leaf and the texture of the soil. Usually, the mulch has to be renewed once in 45 days under Wyanad conditions. The mulch not only protects the young rhizome pieces from the beat of the rain and the intensity of the sun, but also serves to even out the soil temperature and soil moisture. The disintegrated vegetative matter improves the soil tilth and its fertility.



A fine bunch of ginger rhizomes

Since ginger is invariably planted in well-drained open soils, mulching also benefits the following crop. There is evidence to show that *ragi*, vegetables, dry paddy, etc., which very often follow the ginger crop in a rotation, thrive even without any extra manuring.

Ginger is produced in many tropical and subtropical regions of the world including India, China, Jamaica and Sierra Leone. By far the largest production of ginger is in India—12,500 to 14,000 tons, more than 70



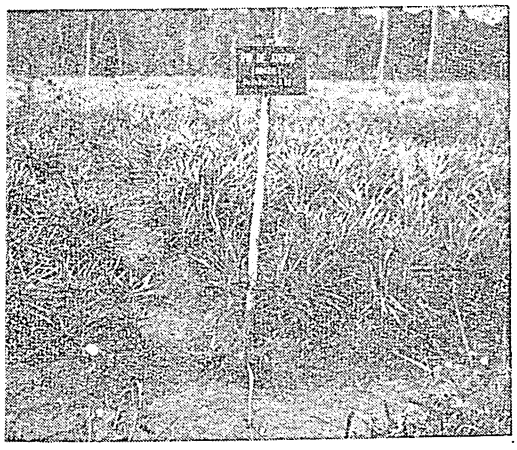
This ginger crop is growing well because it received adequate mulching

per cent of the world's production. This is largely exported to the Middle East countries, which show a preference for the Indian product.

In India, ginger cultivation is mostly confined to the West Coast of the South Indian peninsula, but it is grown on a smaller scale in West Bengal and the Himalayan regions also. The well-known centres of ginger production on the West Coast are the Moovattupuzha and Thodupuzha divisions and the Ernad and Ponnani taluks of Kerala State. Of late, ginger cultivation has spread to the Wyanad taluk of Kerala State and the Gudalur taluk of Madras State. Kerala alone grows about 26,000 acres with ginger, which is nearly 60 per cent of the total area in the country. In these areas, it is cultivated primarily as a pure crop under rain-fed conditions; in certain other areas in the plains, it is raised under irrigated conditions mixed with other crops.

On account of its high fibre-content, the Indian product is considered unsuitable for preservation. This is one of the major causes why the demand for Indian ginger is declining in the U.K., the U.S.A. and Australia. There is, therefore, immediate need to develop superior varieties to meet the demand of the foreign market. If varieties with lesser fibre were brought under cultivation, they would help develop a sizable export trade in this commodity.

Keeping this in view, ten different ginger varieties were tried at Wyanad. Of these, the introduction from



Some exotic gingers under test at the Ginger Research Station, Wynad

West Bengal, known as the Burdwan variety, recorded the maximum yield of 13 times the quantity of seed used, while the Kerala variety from Ernad recorded a nine-fold yield. The exotic variety from Brazil excelled all other varieties in rhizome size, but its total yield amounted only to eight times the seed-rate. In fibre-content, the Ernad ginger stood foremost, recording only 4.29 per cent of fibre as compared to 6.21 per cent of the variety obtained from Mysore State (Karkal).

CONTD. FROM PAGE 7

Two Reapers

to drive the machine, an acre can be harvested in an hour.

The cutting mechanisms of the self-delivery bullock-reaper and the mower work on the same principle. A large travelling-wheel supplies the drive and also carries most of the weight of the machine. With a little experience, the village artisan is able to maintain them.

Shown below is the operational efficiency of the sickle and the bullock-drawn harvesting machines.

	Man-hours	*Machine-hours*	*Animal-hours*
Sickle	53.00	—	—
Bullock-drawn mower with buncher attachment	23.50	1.80	3.60
Bullock-drawn self-delivery reaper	2.00	1.00	2.00

However, there is a limitation in the use of these machines. It is necessary to have sufficient grain crops to harvest to keep them fully engaged for at least 20 to 25 days in a year. Otherwise they will not be economical to own.

CURRENT SCIENCE

(ESTD. 1932)

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The Way to Higher Yields With Oats

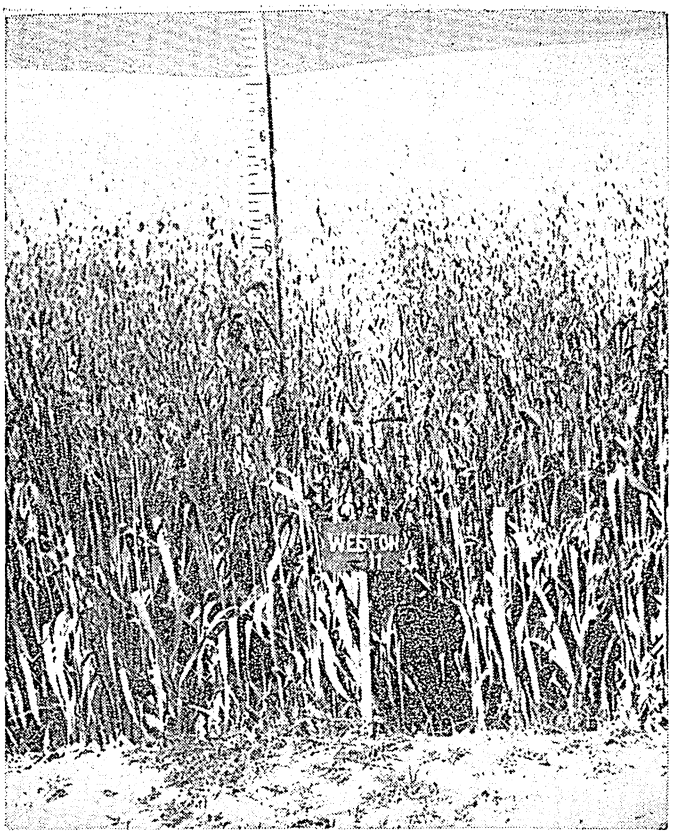
by

H. C. Malik
A. Economic Botanist
Sirsa

A THREE-YEAR experiment at the Sirsa Fodder Research Station has shown the way to higher yields with oats: they must be grown after a legume only. If, however, they are to follow a non-legume, the crop should be adequately fertilized.

Oats is a highly sustaining forage crop of the winter season. It is even preferred to berseem under moisture-shortage conditions. It needs a fertile soil to grow, and responds well to fertilizer. Being a non-legume, it makes a poor growth immediately after another non-legume, but grows well after a legume.

In the experiments at the Sirsa Station, oats were sown immediately after sorghum (non-legume) raised for grain, as well as after lucerne (legume) raised for forage, with and without fertilizer. The fertilizer treatments given were: nitrogen 25 and 40 pounds per acre, and nitrogen 40 pounds plus phosphoric acid 25 pounds per acre—nitrogen in the form of ammonium sulphate and phosphoric acid as superphosphate.



Oats grown after a legume

The crop after sorghum (*jowar* or Sudan grass) was invariably pale and stunted in growth, and that after lucerne, dark green and luxuriant. The fertilizer had a remarkable effect in the former case and practically no effect in the latter.

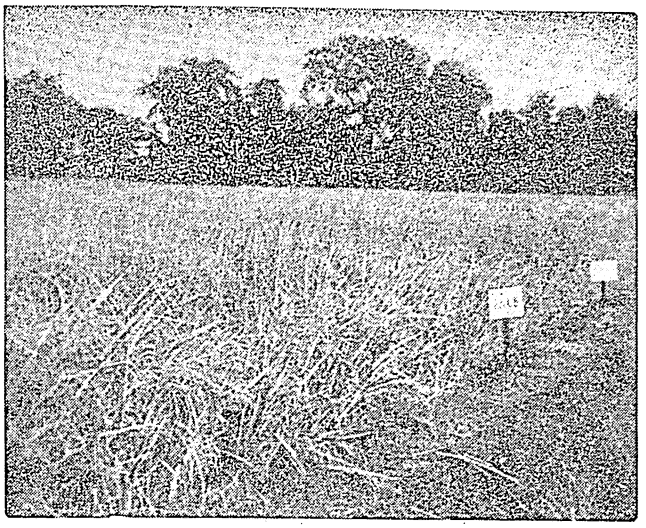
In the matter of grain and straw yields, oats after lucerne gave double the grain yield compared to oats after sorghum. The yield increase with fertilizer in the case of oats after lucerne was insignificant—26.96 maunds with 25 pounds nitrogen per acre compared to 25.70 maunds without fertilizer. There was no increase in yield with 40 pounds nitrogen, or 40 pounds nitrogen plus 25 pounds phosphoric acid. A straw yield of 80 maunds per acre, almost four times that of 21 and 19 maunds given by oats after *jowar* and Sudan grass, respectively, was obtained when oats followed lucerne; this was without fertilizer. Fertilizer application could increase the straw yield from 34 to 52 maunds per acre only.

ISI STANDARD ON FAT IN MILK

The Gerber method is widely used in India for the rapid determination of fat in milk and milk products, when a large number of samples are to be analysed at a time. The method depends on the liberation of the fat by the action of sulphuric acid or milk or milk products in specially shaped, calibrated glass containers, called butyrometers, which are then centrifuged to aid separation of fat, the volume of which is finally read off against the percentage scale etched on the butyrometer.

With the increasing application of the Gerber method for determination of fat in the milk and milk products for commercial need in India, it had become necessary to prescribe a uniform method, using standard apparatus designed to meet the Indian conditions, so that the results, obtained in different laboratories and by different workers, are comparable. With this end in view, the Indian Standards Institution has published a Specification for Determination of Fat in Whole Milk, Evaporated (Unsweetened) Milk, Separated Milk, Skim Milk, Buttermilk and Cream by the Gerber Method (IS: 1224-1958).

Copies of the standard, published in English and priced at Rs. 1.50 each, are available from the offices of the Indian Standards Institution, located at New Delhi, Bombay, Calcutta and Madras.



Ready for harvest is this crop of *BR 34* paddy

If you are raising an early *aman* paddy

BE SURE YOU GROW *BR 34*

by

S. Nezamuddin
Agronomist, Bihar

and

J.S. Flora
Agricultural Research Institute, Sabour

BIHAR farmers can now take paddy production in the State 20 per cent higher just by changing over to *BR 34*—the new early *aman* variety evolved by the State Agriculture Department. By growing this variety, they would gain an additional 50 rupees per acre.

The salient features of *BR 34* (or *2206B*) are profuse tillering, heavy grains and well-filled earheads. It is a selection from the local *Dolangi* of Monghyr district. It is awnless, and yields whitish grains 8.8 mm. in length and 2.6 mm. in breadth which are of medium quality and quite agreeable to taste.

Paddy is the most important cereal crop of Bihar, and the *aman* paddies, which are transplanted from July to August and harvested from late October to December, are the major source of rice in the State. The early *aman* paddies are harvested from the last week of October to the end of November, and cultivators prefer to take a *rabi* crop, particularly wheat, after that. Being an early variety, *BR 34* fulfils that need also.

Before recommending *BR 34* to farmers, several trials with early *aman* paddies suited to different tracts of the State were conducted from 1956-1958 at Government farms as well as on farmers' fields. The improved varieties *BK 115*, *BK 141*, *GAE-1* and *BR 34* were tried, and their performance also compared with the local variety of each tract. *BR 34* outyielded all the other varieties in all the Divisions of the State. Although the varieties were subjected to different climatic conditions, their behaviour was practically the same everywhere.

The yield trend of *BR 34* indicates that it is suitable for the varied soil and climatic conditions of Bihar, ranging from the scanty rainfall to heavy rainfall areas of Purnea district and from the sandy tracts of Saharsa to the hilly tracts of Chhotanagpur. Its percentage of increase over the local is very high and varies from 8.22 per cent in the Patna Division to 35.34 per cent in the Bhagalpur Division.

The variety has also excelled in unit-weight, i.e., weight of a 1,000 grains throughout all the Divisions of the State. Its heavy grains evidently contribute towards its higher yields.

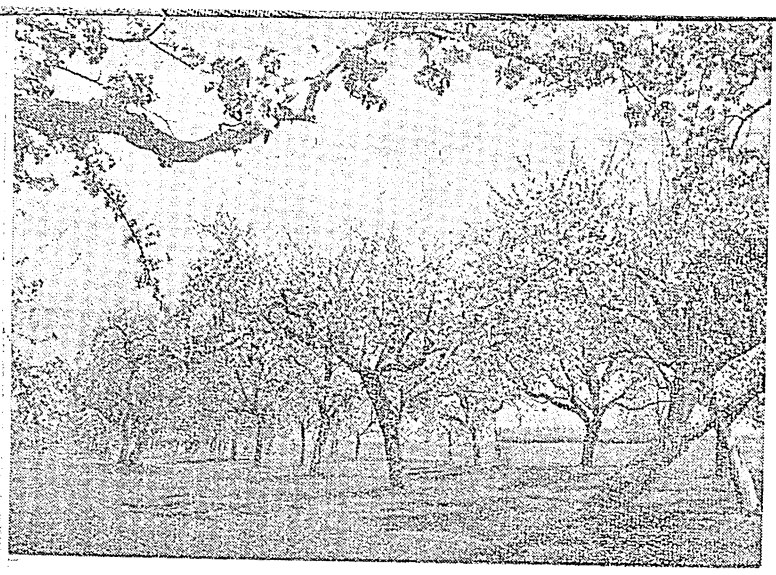
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A GREAT FOREIGN EXCHANGE EARNER

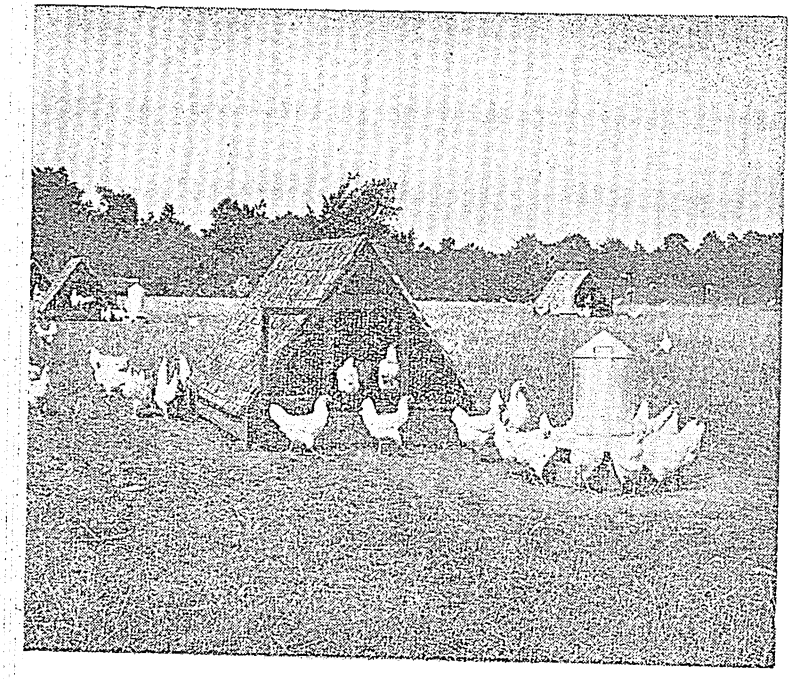
Lemongrass, the red-stemmed growth of the hilly slopes of Kerala, is a great foreign exchange earner. Exports of lemongrass oil, the chief constituent of which, citral, is used in manufacturing synthetic vitamin A, are valued at Rs. 1.6 crores.

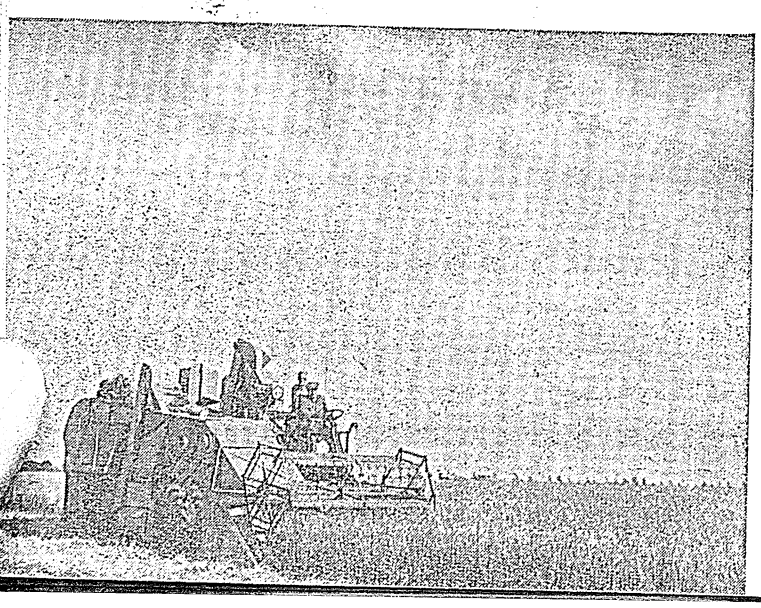
Nearly 80 per cent of the world's supply of lemongrass oil is produced in India.

Almost 97 per cent of the Indian production is exported; the exports touched a record of 2,02,426 gallons in 1956-57.



Let's Talk About Dutch Agriculture





BUT for man's intervention, one-half of Holland would be either permanently or periodically under water; the low-lying country is, therefore, protected against flooding by massive dykes along the coast and along the large rivers.

Behind these dykes the land is divided up into polders (a polder is a piece of low-lying land reclaimed from sea or river), which are in turn surrounded by further dykes. By means of windmills and electric or diesel pumping-stations, the excess water from the polders can be pumped into the rivers or canals, whence it is usually carried off to the sea.

Consequently, during periods of heavy rainfall the low-lying land is not adversely affected by superfluous water. In times of drought, on the other hand, water can be admitted to the polders.

The system of water management enables the ground water-level to be regulated according to the requirements of the crops. Thus, in a polder under field crops the water is generally kept at a low level, whereas in a polder which is used as pasture it is maintained at a high level.

Holland is renowned for its large-scale impoldering projects (including the Zuider Zee works), but the land gained in this way cannot offset the loss of cultivable ground resulting from the expansion of towns and villages.

Holland has a total land area of only 30,000 sq. km. (approx. 11,600 sq. miles), of which just over one-fifth is required for purposes other than agriculture, so that about 23,000 sq. km. (approx. 8,900 sq. miles) is left for agricultural use. Consequently, with a population of

Top: **A well-tended orchard come to flower; the ground is used as pasture**

Middle: **Poultry-keeping is fast becoming popular with the Dutch farmer, and...**

Left: **...modern machinery lightens his task**

11.2 million, Holland has scarcely more than 0.2 hectare (a hectare = 2.47 acres) of cultivable land per head.

The country is for the most part entirely flat ; the only elevations occur along a stretch of the coast (in the form of dunes) and in the south and east.

VARYING SOIL

Soil conditions in Holland vary very greatly. In the south and east there is sandy soil, with river clay along the large rivers, peat deposition along the lesser ones and a mixture of peat and sand in the districts where low moor peat formations have been dug away.

In the west, along the coast, there is a range of dunes, behind which a strip of light sandy soil (sand and peat) occurs. Between the dunes in the west and the sandy soil in the east there is an extensive region of fen peat. At some points, this layer of peat has disappeared and the underlying old marine clay is exposed.

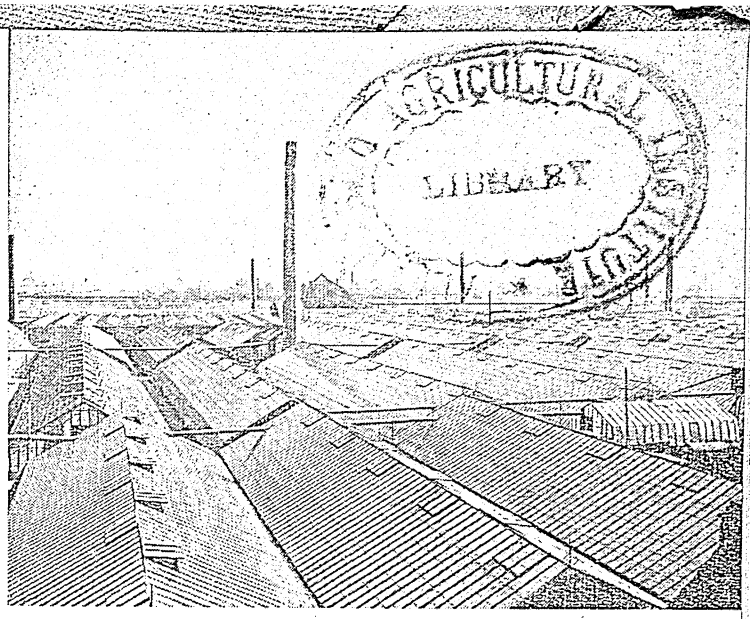
In the south-west and north of the country are found the younger marine-clay soils, which also occur in the Zuider Zee polders.

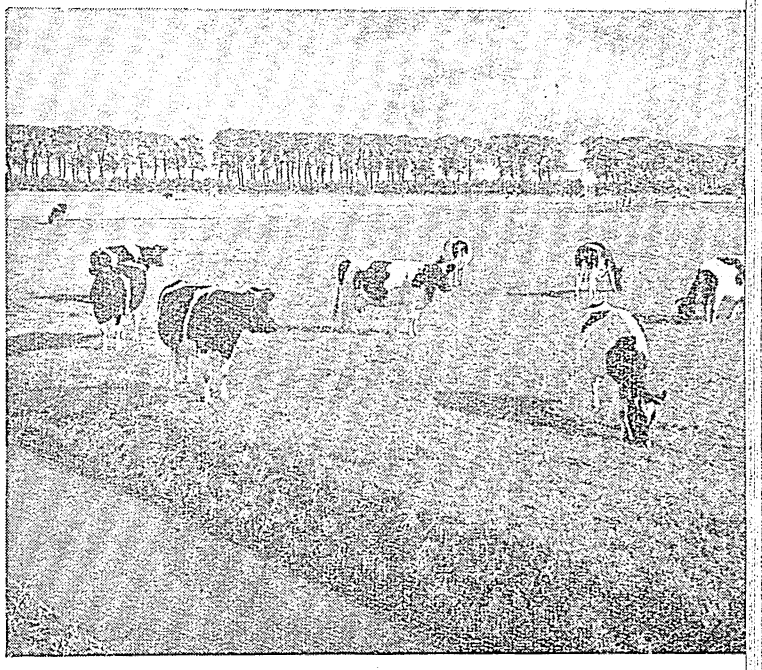
Holland has a pronounced oceanic climate with predominantly westerly winds, which bring mild, moist air from the sea. The average maximum day temperature in July is 21°C (69.8°F), while the average minimum night temperature in January is −2°C (30.2°F). The annual rainfall averages 740 mm. (29.1 inches) and is fairly evenly distributed throughout the seasons.

SMALL ESTATES

Large estates are practically unknown in Holland; altogether there are only 150 holdings of more than 100 hectares and these account for less than 1½ per cent of the available cultivable land. Of the 178,000 farmers just over 100,000 have less than ten hectares of land at their disposal, 50,000 between ten and 20 hectares, and slightly over 25,000 twenty hectares or more.

Approximately 500,000 people, or a little under 12 per cent of the working population, are employed in agriculture in Holland. The execution of large-scale land exchange and re-allocation plans is further improving the efficiency of the fa ms, as a result of which the labour requirements are decreasing. The mechanization of agriculture is increasing by leaps and bounds, in consequence of which the labour force can be expected to decrease even more.







Top: **A number of vegetables are grown in these hothouses near The Hague**

Middle: **The Dutch black-and-white dairy cattle are renowned for their high milk yield**

Right: **Fields of grain on what was formerly the bottom of the Zuider Zee**



Large quantities of vegetables are still brought to the auctions by barge

Although the average size of the farms is small the number of mechanical aids is still constantly increasing. The number of tractors rose from about 4,000 in 1940 to 24,000 in 1950 and 61,000 in 1957. The number of milking machines increased from 9,000 in 1955 to 23,000 in 1958 (39,000 appliances). The farms are very well provided with ploughs, harrows, cultivators, mowing machines, hoeing and turning machines, sowing and planting machines, manure-spreaders and spraying or misting equipment.

Particularly careful attention is paid in Holland to the fertilization of the land. In addition to the natural manures obtained from Dutch farm animals and the compost produced from the domestic refuse of the large cities, very large quantities of artificial fertilizer are used. Holland's consumption of artificial fertilizer per hectare of cultivable land is the third highest in the world. The soil, which in many cases was formerly infertile, has been made fertile by the farmers.

CREDIT BANKS

Scattered throughout Holland are hundreds of co-operative farmers' credit banks in which the farmers can deposit their money and from which, in most cases, they can also obtain loans to finance and/or improve their farms. The banks are amalgamated in two large central co-operatives. Various farm necessities, including artificial fertilizer and feeding-stuffs, are often centrally purchased by the agricultural co-operatives.

There are in Holland 23,000 day and evening schools at which primary agricultural education is provided and another 200 for agricultural education at the secondary level. In addition, there is an agricultural university. The total number of pupils and students is about 63,000.

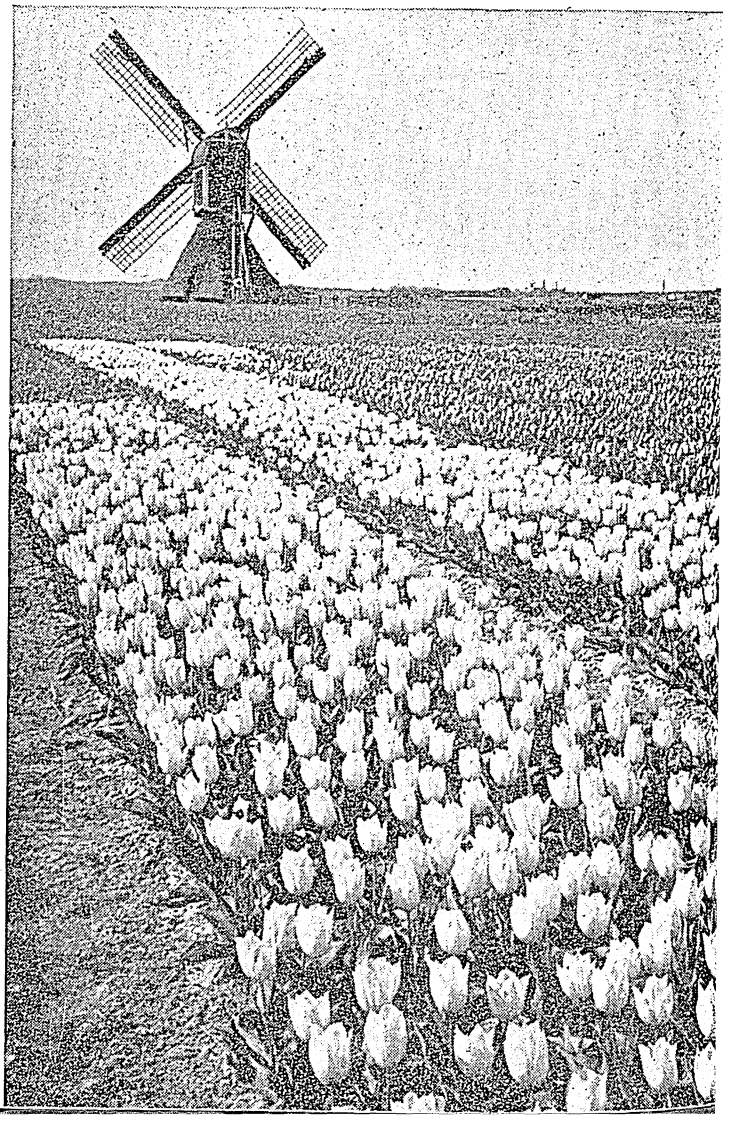
Farmers and horticulturists can avail themselves of the services of Government advisors in the fields of arable farming, horticulture and stock-breeding. At the Government agricultural experimental stations, new breeds of animals and methods of cultivation are tried out and new means are sought for the protection of plants against disease. Agricultural science is at such a high level in Holland that many foreigners go there to study it or to take special courses in that field.

Arable farming in Holland is carried on in the sandy soils, the river-clay and marine-clay soils. On the sandy soils, mixed farming (arable farming and stock-breeding) predominates; on the river clays, fruit is grown as well; on the marine-clay soils, the accent is on arable farming proper.

PRINCIPAL PRODUCTS

The area under field crops amounts to 900,000 hectares, i.e., 39 per cent of the total acreage of cultivable land. The principal products are cereals (rye, oats, wheat and barley), ware CONTD. ON PAGE 39

An inevitable tourist attraction are the bulb-fields in flower



Plan Your Irrigation System

by

N.B. Pradhan

Basic Agricultural School
Adhartal, Jabalpur

TO get the maximum out of his crops and the irrigation water at his disposal, the farmer must *plan* his irrigation system.

Efficient irrigation means that only so much water is applied to the soil that the moisture-content in the root-zone conforms to its normal moisture-retaining capacity. Any extra water added is lost by percolation. This loss is bad, not only because it is waste of water, but because it raises the water-table in low areas, causing water-logging and salinity. These conditions are very harmful to crops.

As the moisture from the soil is lost either by evaporation or transpiration, a point is ultimately reached when the remaining water is so tightly held by the soil that it does not become available to the plant roots. As a result, the plants wilt. Irrigation should be resorted to before the moisture-content in the soil falls to the wilting point.

Irrigation is primarily the practice of supplementing the rainfall. When long breaks occur between rains, crop growth is retarded. Irrigation, therefore becomes necessary to assure a continuous and rapid growth of crops.

India has perhaps the largest irrigated area in the world, but the irrigation methods generally adopted by farmers cannot be said to be quite efficient. In planning an efficient irrigation system for your farm, many important factors have to be taken into consideration.

SMOOTH SURFACE

An ideal field for irrigation is one which has a smooth surface and a slope of about 0.3 to 1.5 per cent (1/3 foot to 1½ feet fall in a linear distance of a 100 feet). Slopes up to five per cent can be irrigated without much difficulty. Slopes up to ten per cent can also be irrigated, but the cost of levelling and laying out the irrigation system would be prohibitive. Slopes steeper than this may better be utilized for growing grasses.

For giving the land the desired slope, it may be levelled in such a way that no pockets or small hillocks are left, so that the water gets distributed evenly. At the same time, care should be taken not to expose the subsoil.

IDEAL SOIL

An ideal soil for irrigation is a deep fertile loam or sandy loam with good drainage. A medium type of soil is better than either a too light or a too heavy one. The soil profile has also to be taken into account. The subsoil must allow proper drainage.

The problem of alkali is very important in dry regions. The soil should be largely free of salts and absorbed sodium, or should be adaptable to reclamation. On the basis of alkalinity, soils may be classified as below.

Salt-free soils	0 to 0.2	per cent
Low salt concentration	0.2 to 0.35	,,
Moderate salt concentration	0.35 to 0.65	,,
Strong salt concentration	Over 0.65	,,

The last two soil-types are unsuitable for most commercial crops. If the soils have proper drainage and if enough water is available, some of these may be leached out, although it may need some time and money.

GOOD WATER

Just as soil, the water available for irrigation should also be free of salts, or it will lead to

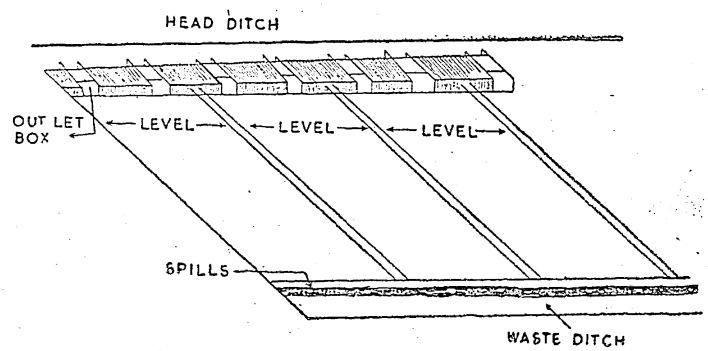
alkali deposits in the soil. Economic farming can be assured only by a proper use of land and water. Improper use of these may create new problems such as soil erosion, alkali accumulation, leaching or water-logging, and render land unfit for production.

It may not be very difficult to irrigate crops like paddy (which is grown in bunded and fairly level fields), sugarcane and some vegetable crops (which are planted in furrow beds). But the most difficult task is to lay out an irrigation system for wheat fields which are generally undulating in all directions. The problem becomes all the more acute when the land has to be irrigated from a canal and when a certain cultivator refuses to allow the water to pass through his fields.

HOW TO IRRIGATE

Of the irrigation methods commonly adopted in India, flooding is the least efficient. It consists in opening a water channel so that water may flow about in all directions. Men with wooden shovels guide the water-flow by making a small channel or bund to cover as large an area as possible. This method requires abundant water and is usually adopted for close-growing crops in open fields like wheat and gram. It does not involve the cost of making irrigation beds, but the distribution of the water is very uneven.

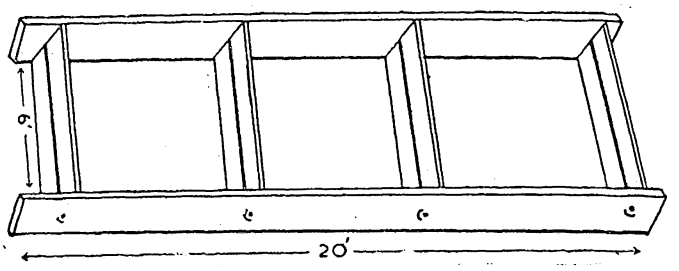
The basin or *kyari* method is commonly used for paddy and some vegetable crops. In this case, each bed (*kyari*) or basin is levelled and is surrounded by a few



Border strips

inches to several feet-high bunds. The method is adopted in soils like sandy loam and loam, and for crops like paddy where water has to stand a few inches deep in the beds. In this case also an abundant supply of water is needed.

The method is commonly used for sugarcane, potatoes and some other vegetable crops which need earthing. On slopes, the furrows must be made in contour or across the slope. The irrigation water does not come in direct contact with the roots of the crops and has to soak down. Skilled labour is necessary for making furrows as well as for conducting the irrigation.

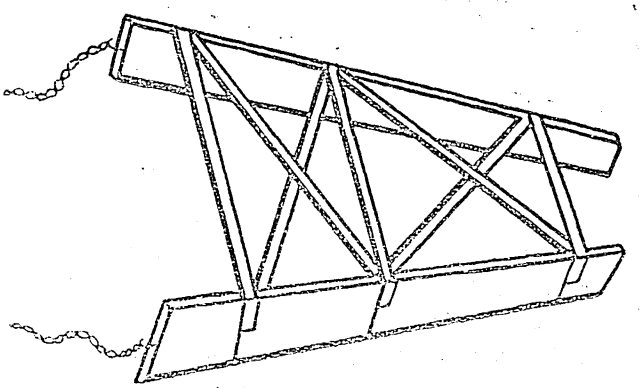


A float

There are other methods like sprinkler irrigation and sub-irrigation which are very costly and beyond the reach of an ordinary farmer.

TWO GOOD METHODS

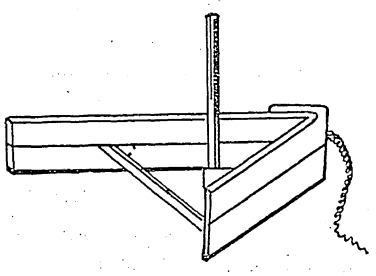
The border strip method and contour ditches are two improved methods of irrigation which would help the



A bund-former

farmer design an efficient irrigation system for his farm. Before laying out such a system for wheat fields, one has to find out the topography of the field. If the fields are level on one side and gradually sloping along the other, border strips may be prepared. For an undulating surface, contour ditches are recommended.

A **border strip** is a narrow tract of land with small ridges on all sides. The land is smoothly graded in the



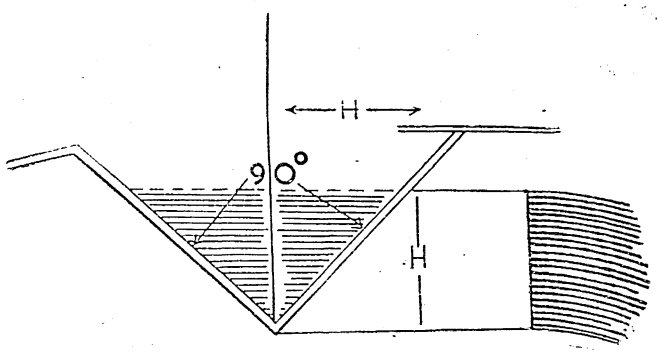
A V-ditcher

direction of irrigation, with no cross-slopes so that the water will flow uniformly. Irrigation by this method gives a uniform distribution of water and prevents waste. You can also avoid having too much irrigation in low

spots and too little in high ones by grading the land properly.

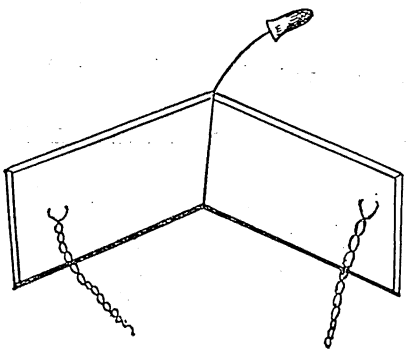
The length and the width of the strips depend on the soil texture, the slope of the land and the water flow. In light soils, or with a small flow of water, the size of the strip can be reduced. Depending on these factors, the width can be from ten to 50 feet and the length from 30 to 400 feet.

Besides the common plough, the implements required to prepare border strips are: a float, a bund-former, a V-ditcher and a scraper.



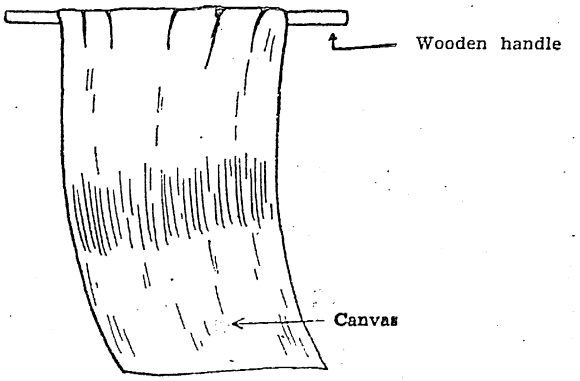
A 90° V-notch as seen from front

Plough and cross-plough to loosen the soil, leaving no hard spots. Mark the location of the head-ditch along the higher side of the field and the waste ditch along the lower side. Determine the width of the strips and mark the position where ridges are to be made. Remove the soil from the higher spots and fill in the low spots to make the strip level. This is done with the scraper.



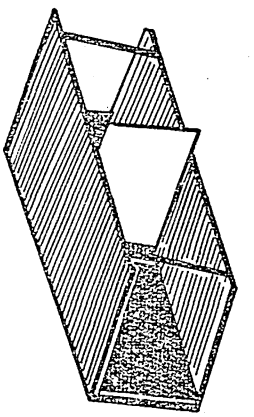
A scraper

Plough and cross-plough again, so that further levelling can be done. This is best done with a simple wooden implement called the "float." Make the head ditch with the V-ditcher. The bed of this ditch should be higher than the strips. Then make ridges along the marked line with the help of the bund-former. Scrape uniformly from both sides of the ridges. About 20 feet of the land below the head ditch must be perfectly level and then uniformly graded along the length of the border and again level along the width. Dig a waste ditch along the lower end of the strip.



A canvas dam

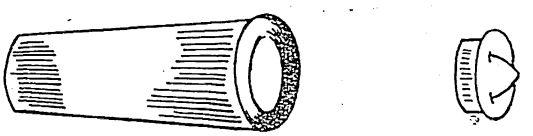
Fix turn-out boxes or earthen spills to regulate the water flow from the head ditch into each border



A turn-out box with shutter

strip. A canvas dam may be used to divert water from the ditch into the turn-out boxes. Earthen spills may be fixed at the lower end to let water into the waste ditch.

For **contour ditches,** the contour lines have to be marked in the fields. A gradual grade of about one to two inches for every 100 feet may be given to these ditches to allow a gradual flow of water. The land



An earthen spill with lid

between the two contours may be levelled and irrigation done in the same way as in border strips.

To find out whether enough irrigation has been done, a probe may be used. This is an iron bar about half an inch thick, pointed at one end and fitted with a handle at the other. Press this probe into the soil: it will penetrate easily as deep as the water has reached. Pull it out and find out if sufficient depth has been irrigated; if not, irrigate more.

Paprawat Excels

Of the 305 villages constituting the five Development Blocks in the Union Territory of Delhi, Paprawat in the Najafgarh Block was recently adjudged the most progressive in farming methods.

The village has maintained a really commendable record of progress since the National Extension Service was inaugurated in the Block in 1953. The entire cultivable area of 1,247 acres is under *C.281*—a high-yielding, rust and smut-resistant, early-maturing variety of wheat; equally popular is the *N.P.58* gram. The targets originally fixed have been exceeded in many cases: 120 Persian wheels as against 60; 200 compost pits as against 150; 1,450 maunds of ammonium sulphate, superphosphate and urea as against 850; 200 agricultural demonstrations as against 150.

The wheat yield in the village has gone up from 12 maunds to over 30 maunds per acre, and the cultivator has gained an additional profit of Rs. 180 per acre. On two model farms, yields as high as 45 maunds per acre have also been recorded.

The Paprawat farmers raise their wheat crop by what has come to be known as the Delhi Method. First of all, they ensure that no stubble of the previous crop is left in the field; it is then given eight to nine ploughings. Six to eight weeks before sowing, farmyard manure at ten cartloads per acre is applied to the field. The crop also gets a maund of ammonium sulphate and a maund of superphosphate per acre.

Seed at 50 seers per acre is used, and the crop sown

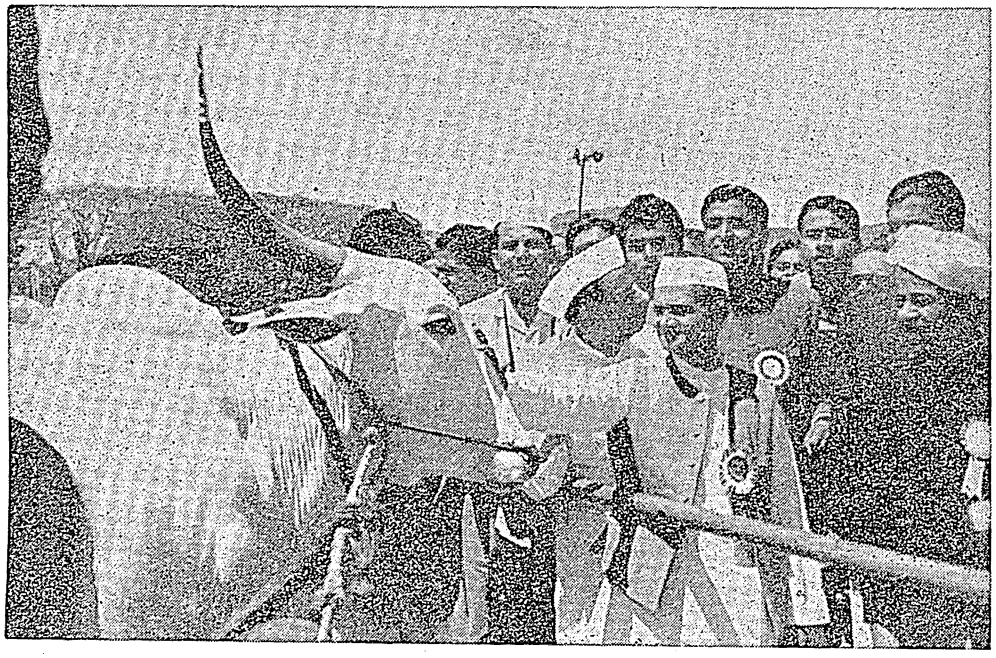


Paprawat farmers prefer to grow *C. 281* wheat, for then they are sure of a good crop

Bangalore Cattle Show

About a 1,000 entries for cattle, a 1,000 for poultry and 60 for sheep and goats, apart from horses, etc., were received at the 17th All-India Cattle and Poultry Show held at Bangalore from February 22 to March 1 this year.

Picture shows Shri Lal Bahadur Shastri, Union Minister of Commerce and Industry, who inaugurated the Show, admiring a bull.



AGRICULTURAL LIBRARY

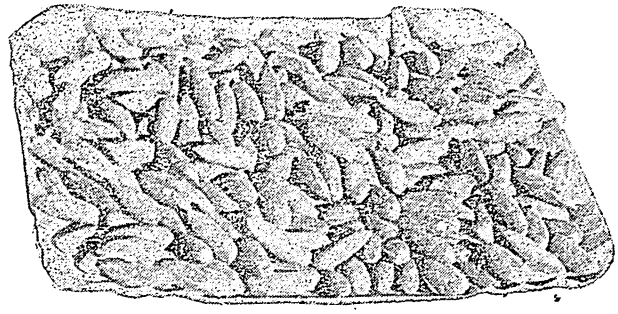
News and Pictures

in lines. As the soil of the village is sandy loam, at least five irrigations are given to the crop—four up to January and the last one in February. When the crop is about a foot high, all weeds like *piazi, bathu* and *polili* are pulled out. Adequate steps are taken to save the crop from insect pests and rats.

Rampur Agricultural Show

For the last two years, the Himachal Pradesh Department of Agriculture has been putting up an Agricultural Produce Show at Rampur (Bushahr) at the time of the annual Lavi Fair from November 11 to 13.

The Show has caught the imagination of the hill people, and the number of entries received has increased from 650 in 1957 to 1,400 in 1958. Excellent quality dry fruits, such as pine nuts, hazel nuts, walnuts and almonds, which grow only in the Chini area, were exhibited at the Show last year. Exhibitors of winning entries were awarded a number of cash prizes and trophies.

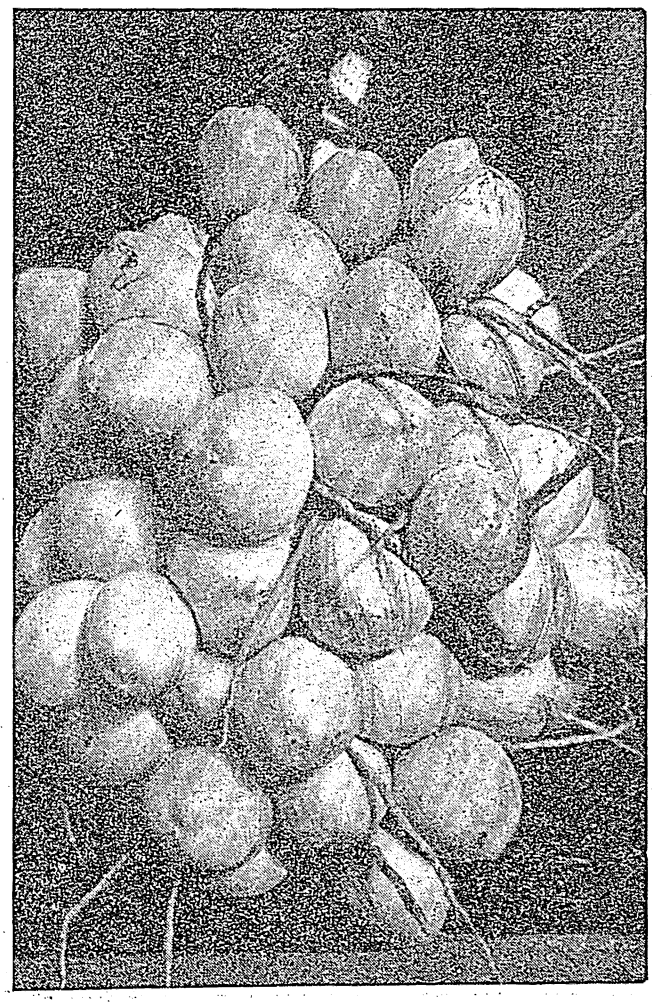


Prize-winning chilghozas at the Show

The Lavi Fair derives its name from *loi*, local for a woollen blanket. It is in fact a trade *mela* for the hill people who come to attend it from as far as Tibet Chini, Lahaul and Sipiti. They bring *pattus, lois,* shawls, *pashmina,* raw, fine and assorted and other types of wool, and mules and horses, which traders from different parts of India assemble at the *mela* to buy. On return the villagers buy utensils, foodstuffs and other articles of daily use with the money thus earned.



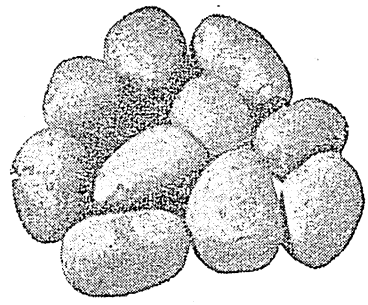
Raw wool is traded in large quantities at the Lavi Fair. A hill tribesman using an indigenous scale



83 Coconuts A Bunch →

This bunch of 83 coconuts is from a palm in the two-acre garden of Shri Kottakudi Venkatrama Naicker, of Pattukottai in Thokkalikadu in Tanjore district of Madras State. Most of the palms in his garden yield heavily due to regular ploughing thrice a year, cattle-penning, and application of tank-silt and wood ash.

try these tasty potato snacks



WE would not eat, as we do today, just nine pounds of potatoes per head per year if we knew how high the potato ranks as an article of diet. Its carbohydrate content, the chief energy-producing constituent, is about the same as that of wheat bread ; the body-building protein content is lower, but its quality is very high. It is a rich source of vitamins C and B_1. In Holland and in many other countries it appears on the table daily.

And then, the potato is a versatile product. You can boil it, bake it, roast it and fry it, and you can mash it, use it in salads, and so on. Here are a few tasty snacks that the potato can provide you.

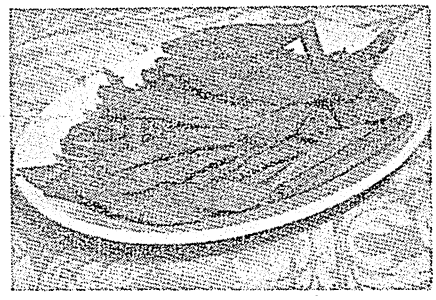
FRIED POTATOES

(made from raw potatoes)
Potatoes One seer 2 *chhataks*
Salad oil $1\frac{1}{4}$ *chhataks*

Peel the potatoes, wash them and cut them into slices (small new potatoes can be left whole). Dry them well in a cloth. Heat up the oil, not allowing it to smoke, in a frying pan, and fry the potatoes in this for ten minutes until they are partly done (put a lid on the frying pan—turn the potatoes now and again). Then let the oil get hot enough to smoke and fry the potatoes without the lid until they are done brown. Sprinkle a little salt over them when serving.

POMMES FRITES

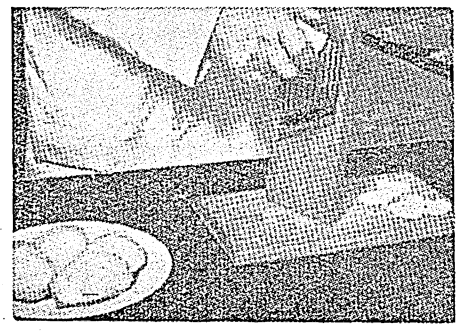
Use fairly large potatoes for this. Peel and wash them. Then cut them into slices about a quarter of an inch thick, and cut these slices into strips. Dry well in a clean cloth and then fry until done, but not brown (about 15 minutes) in a not too hot frying pan. This frying can be done some time beforehand, if desired. Shortly before required,



let the fat get smoking hot and quickly fry the strips in this until they are crisp and golden-brown. Sprinkle with a little fine salt. Pommes frites should be soft inside and crunchy on the outside.

WAFER POTATOES

Set the scalloped cutter to cut fairly wide. Pull a potato across the cutter, turn it half a turn and pull it over the cutter again. Repeat this. In this way, wafers



can be made. These are fried golden-brown in the frying pan and served sprinkled with salt.

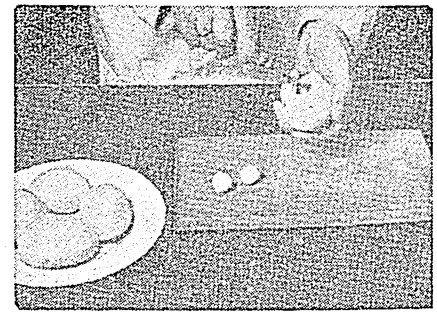
POTATO CUTLETS

Potatoes One seer 2 *chhataks*
Flour $\frac{1}{2}$ *pao*
One egg, salt and frying fat

Grate the potatoes on a coarse grater. Stir in the flour, the egg and the salt dry. Pour this mixture by the teaspoonful into hot frying fat and fry brown on both sides.

POMMES PARISIENNES

By means of a potato scoop, cut small round potatoes out of a large peeled potato. Boil these until done (about ten minutes) in a little water with salt. Take care in boiling,



since they soon crumble. They can also be fried in the frying pan in butter. To do this, first fry them until half done in a tightly closed pan and then finish them off in the pan without the lid until they are golden-brown. Sprinkle with salt and serve. They go well with stewed fish.—*Recipes and pictures from "Potato News"*

AGRICULTURAL LIBRARY

More Cash From Cotton

by

Kartar Singh "Dewana"

THERE was a time when growing of cotton was not so popular with the Punjab farmer. But today he fully realizes its importance as a crop that brings cash to him. I have now been growing cotton on my farm for a number of years, and my yields have also been very good all along. In fact, any farmer who pays attention to the following few things can get better cotton yields, and thereby more cash.

Cotton needs a fertile soil. The best cotton yields are obtained when it is grown after berseem. The other alternatives in order of yield would be: cotton after gram, cotton after fallow, cotton after *guara*, cotton after *taramira* and cotton after wheat.

Whatever the previous crop, two irrigations are necessary to start with. The advantage of these is that the crop can stand the heat of June-July even without any further irrigation for some time.

After the first irrigation, two ploughings should be given ; then the second irrigation and another two ploughings. An equal number of *sohagas* is also necessary. Farmyard manure at four cartloads per acre should be worked into the field. More manure can be added, but that would depend on the fertility of the soil.

WHAT VARIETY

The yield would also depend on the variety used. The varieties *LSS*, *216F* and *320F* are well-known. *320F* has succeeded quite well on my farm at Amargarh in Sangrur district of the Punjab. This variety is particularly useful for farmers who want to take a wheat crop after cotton because it is early-maturing. *LSS* is a late variety. On *barani* lands, *216F* should be grown.

Usually, it is not advisable to sow wheat after cotton. It is better to grow berseem, *senji* or *guara*, or leave the land fallow.

A seed-rate of at least 1½ seers per *bigha* should be used. If all the seed germinates, the seedlings can later be thinned out. If you are late, use more seed, and if you are early, reduce it. Before sowing, soak the seed in water for five or six hours. Then rub the seed with sand, earth or cow-dung.

If cotton is to be raised after wheat, the land preparation should be commenced immediately after the harvesting of wheat. If you want to reap a good cotton yield, sow cotton as soon as possible thereafter, even if you have to postpone the threshing of wheat for a few days. The best time for sowing cotton would be from the second half of April to the first half of May.

SOW IN LINES

If your soil is quite fertile and you also manured it well for the previous crop, sow cotton with a drill in lines 3 to 3½ feet apart; otherwise, keep the distance 2½ feet. Always sow in straight lines so that the ploughing with the *triphali* later would not harm the plants. I keep the lines straight with the help of a rope. Never work the *sohaga* after sowing cotton, as it would affect the germination of the seed adversely. Cotton should always be sown in the evening and never in the morning.

The first irrigation would depend on the condition of the crop and your own judgment. It should preferably be given after a month or 1½ months of sowing ; the longer the first irrigation is delayed, the better it is. However, while irrigation can be neglected in the preflowering stage, the land should not be allowed to dry once the flowering has started. On this would depend the ultimate yield.

About ten days after sowing, the crop should be bar-harrowed lengthwise. It should be again bar-harrowed after another 20 days, this time breadthwise. Thereafter, two ploughings may be given with the *triphali*: the first after a month, and another 15 days after that. The *triphali* must be worked at least four times.

When bolls start forming, the ploughing with the *triphali* should be stopped. Otherwise, the bolls would shed. Better take up the *khurpa* thereafter, but this is usually very costly to the farmer. If the land has been prepared well in the initial stage, this operation can be easily done away with.

TWO THINNINGS

The cotton crop should be thinned twice: first, a month after sowing and then, after another 15 days. The plants should stand at one foot to 1½ feet.

If the crop appears to be pale, ammonium sulphate may be applied in the first week of August. The ammonium sulphate should be given at ten to 15 seers per *bigha* in two equal doses with an interval of 15 days.

The fertilizer may be applied in the irrigation channel where well

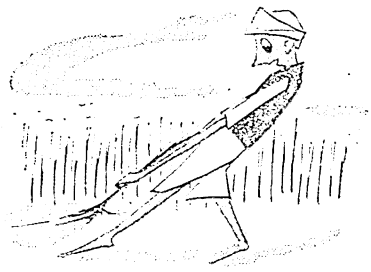
CONTD. ON PAGE 31

WHAT'S NEW IN FARMING

ROGUING CROPS

MANY farmers do not realize that the small inconvenience of pulling out undesirable plants from their fields and thereby a small loss of yield this year, pays well in the coming years.

If they want an improved variety to yield well, the first condition is that they keep it pure. If the seeds get mixed up, the crop would not ripen uniformly and the yield and quality of the produce would also go down. Hence, the produce will fetch a lower price.



Farmers should, therefore, see that no inferior varieties or diseased plants grow along with the improved variety. This they can ensure by "roguing" the crop, which means removing undesirable plants from the field before harvesting. Only then can they keep the crop healthy and pure.

Farmers should rogue out all diseased plants and burn them, and also remove admixtures of any kind. While harvesting a crop, they should also make sure that they do not mix up different varieties. They should thresh each variety separately and store the seed after drying in clean and disinfected containers.

A NEW LINSEED

A NEW variety of linseed, named *T. 126*, has been selected for the north-eastern districts of Uttar Pradesh.

In trials conducted at Bahraich from 1954-55 to 1956-57, the new variety has given about ten per cent more yield than the previously recommended *Type 477*, and about 40 per cent more than the local. In yield tests in different regions all over Uttar Pradesh, the increase in the yield of *T. 126* over the local ranged very high. Though it has yielded as high as 1,584 pounds per acre, the average yield is 800 pounds. The oil content is about 41·4 per cent.

Besides, the new variety is rust-resistant, early-maturing (140 to 145 days) and bold-seeded (102 seeds per gram), while *T. 477* and the local varieties are late-maturing, highly susceptible to rust and small-seeded (175 and even more seeds per gram).

Type 126 will meet the long-felt need for a suitable variety for this important alluvial linseed-growing region of Uttar Pradesh, which accounts for 48·0 per cent of the total linseed acreage in the State.

NITROGEN APPLICATION TO SUGARCANE

HIGHER cane yields and good jaggery quality have been recorded at the Sugarcane Research Station, Anakapalle, by completing the total nitrogen application to the crop within 4½ months—half the dose at 1½ months and the other half, three months thereafter. Fertilization within three months was noticed to record a slightly better juice quality.

The tests were conducted with the sugarcane variety *Co. 419*. It was given a topdressing of a 100 pounds nitrogen as ammonium sulphate at different stages of growth between 1½ and six months of planting. The crop was harvested at 12 months.

RESISTANT FLIES

In many areas, flies have become resistant to the insecticides commonly used.

Before you come to any conclusions regarding the programme you are now working with, be sure you are using the chemical in the concentration and quantity recommended by the manufacturer. A weak spray or a thin application will not do the job!—*Pacific Poultryman*

* * *

RECKON UP FOR YOURSELF

Here are points which answer the question "Should I keep my pullets a second year?"

Advantages

(1) Hens lay larger eggs, which sell for higher prices.

(2) Depreciation per bird is spread over a longer period of time.

Disadvantages

(1) Old hens lay 20 to 30 per cent fewer eggs.

(2) During a six to eight-week moult a hen will eat 15 pounds of feed.

(3) Mortality is usually higher.

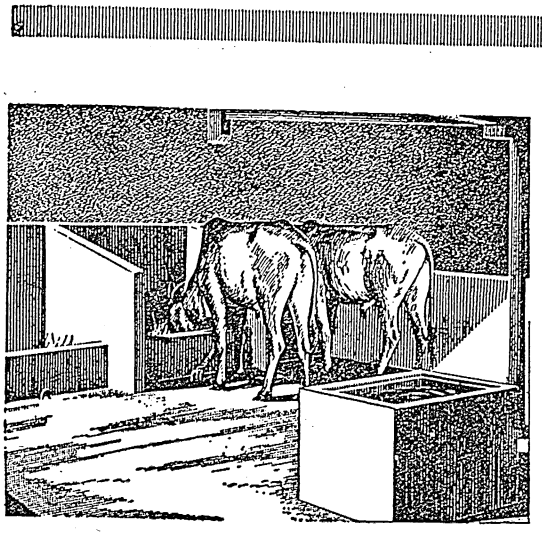
(4) Egg quality is lower.

(5) Feed costs per dozen eggs are higher.

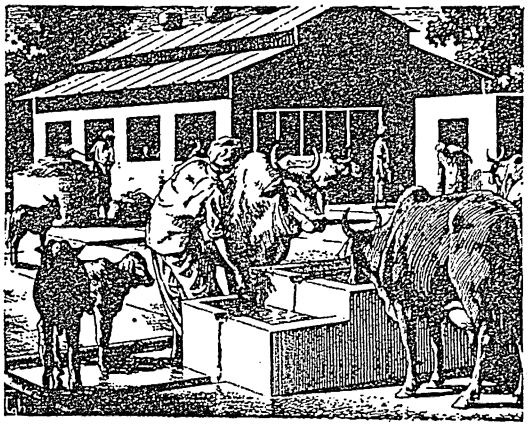
Conclusion

Profits in holding over pullets vary from year to year depending on seasonal egg prices. Keep the cream of the flock—those that are heavy layers—in good health. —*G. L. F. Egg Business*

AGRICULTURAL



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farm flashes

Berseem fertilized with 3⅛ maunds of triple superphosphate per acre has been seen to yield an extra 102 pounds of green fodder per pound of phosphoric acid applied ; *methra* gives about 54 pounds extra and *senji* about 52 pounds extra.

The quality of fodder also improves.

In the Punjab, treating groundnut seed with "Ceresan" before sowing, spacing the crop properly and application of ammonium sulphate have been found to increase yield from about 11 maunds of pods to 32 maunds of pods per acre.

Ammonium chloride is as good as ammonium sulphate for most crops like paddy, maize, sugarcane, cotton and *jowar*. It contains 26 per cent nitrogen as against 20 per cent in ammonium sulphate. It is specially suited for water-logged soils.

Potato varieties like *Uptodate* (Simla *Numbri*), *Furore* and *Craig's Defiance* respond more to potassic fertilizers than do the indigenous varieties such as *Phulwa* and *Darjeeling Red Round*. A dressing of three to four maunds per acre of sulphate of potash applied in furrows before planting is the normal dose.

Capsularis jute as an earlier additional crop can be fitted well in a double cropping programme with transplanted paddy. About 11 maunds of jute fibre can be obtained from the same land by growing it only for 90 days. The slight reduction in the paddy yield (second crop) can be more than made up by manuring the paddy crop.

White grubs of cockchafer beetles appearing in the soil in coconut gardens after a few showers can be effectively controlled by drenching the affected soil with spray fluids of BHC, or incorporating BHC five per cent or "Chlordane" five per cent dust into soil.

Wherever mastitis is present in dairy cattle, losses can be minimized by simple hygienic measures. The affected animals should be isolated and milked by a separate *gwala* or, at least, milked last. The udder and teats should be cleaned with three per cent "Dettol" before milking and dried with cloth, using a separate cloth for each cow. The milker should wash his hands with soap and water, and next with a disinfectant ; the process should be repeated before milking the next cow. The teats should not be left in a wet condition.

Feeding of fresh goat-blood to poultry at the rate of an ounce per pound per day has been found to increase egg production by at least ten per cent. Similarly, *lassi* at ten pounds per hundred birds makes chicks grow faster and better ; when given to adults, it increases egg production by at least seven per cent.

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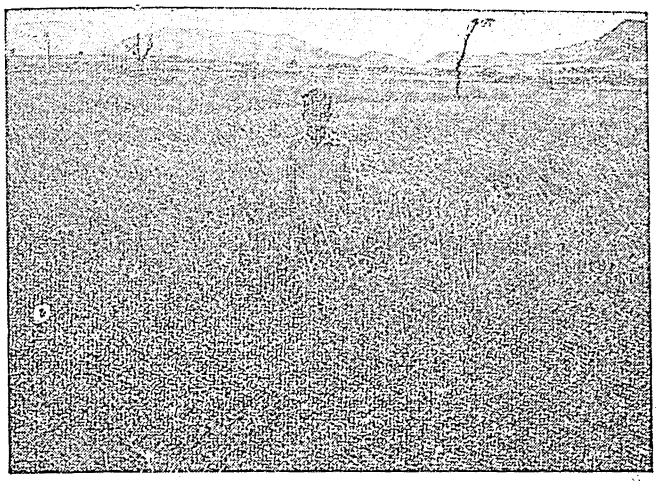
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ONE IMPROVEMENT, A 1,000 RUPEES MORE



This paddy crop shows that soil conservation is paying dividends to farmer Nadar

HOW one single improvement on his farm, bunding of the fields, has added another thousand rupees to his income was revealed to me by farmer Nataraja Nadar whom I met some time back. Shri Nadar belongs to Mathamapalayam, Bilichi village of the Perianaikanpalayam N.E.S. Block in Coimbatore taluk of Madras State. He cultivates 12 acres of land, of which eight are dry and four irrigated by a well.

Hitherto his cropping pattern had been: 0.42 acre under summer paddy, 0.60 acre under the main paddy crop (between July and December), one acre under *MCU 1* cotton, one acre under tomatoes and the remaining four acres under *cholam* followed by *ragi*. The dry cropping comprised two acres under groundnut and two acres each under *jowar*, *varagu* and horse-gram.

Now it is: turmeric on half an acre, vegetables on half an acre, tomatoes on one acre, *MCU 1* cotton on one acre, *bajra* and *jowar* on half an acre each, and a double crop of paddy on 1¼ acres.

His per-acre paddy yield has increased from 2,500 to 5,000 pounds, "because now the rain water does not run off and wash away the topsoil, but soaks into the ground. This keeps the water level in my well also at six feet instead of three feet of before," he said, "and I get extra water to raise more and better crops."

Of course, he still sticks to his old manuring schedule which is fairly heavy: a 100 cartloads of tank-silt once in four years, and 4,500 heads of sheep, 60 cartloads of cattle manure and 224 pounds of ammonium sulphate plus a thousand pounds of bone sinews every year. After the harvest of the second crop of paddy, he green-manures the field with sannhemp.

Even his dry crops have started yielding more to the extent of Rs. 200. This too he confidently ascribes to the bunding of the fields, "for more moisture is now available to them," he says.

—M.J.D.

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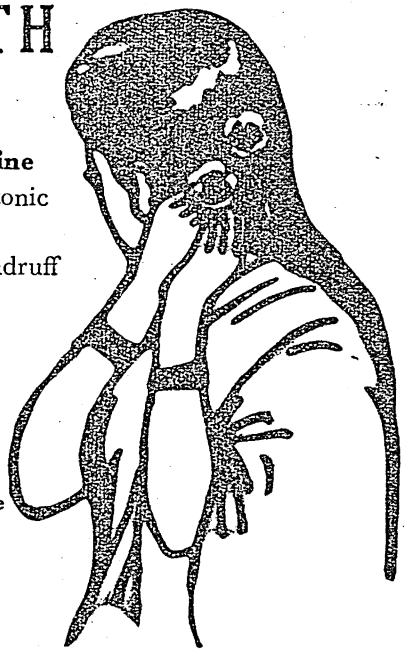
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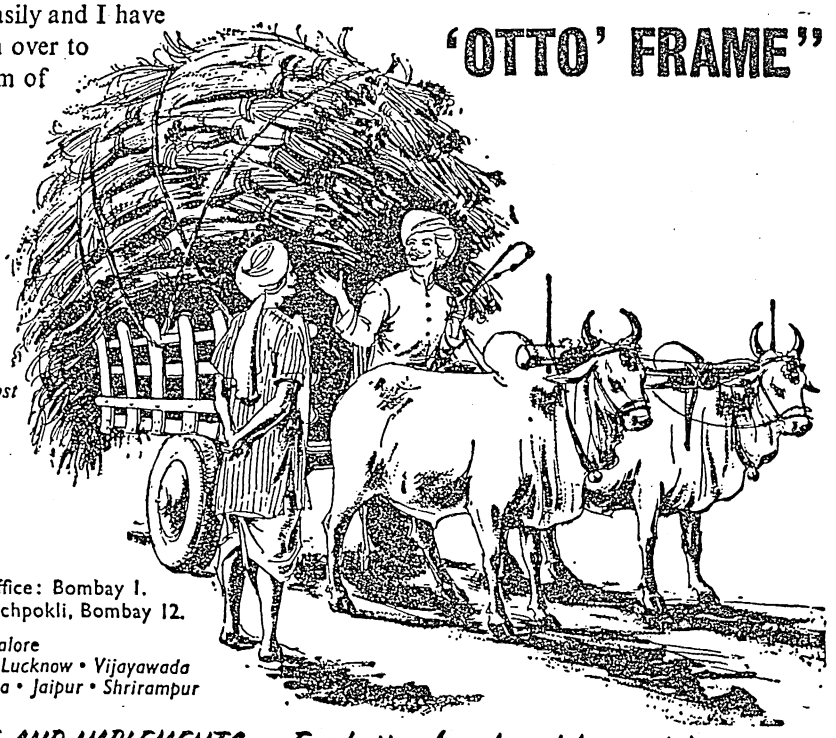
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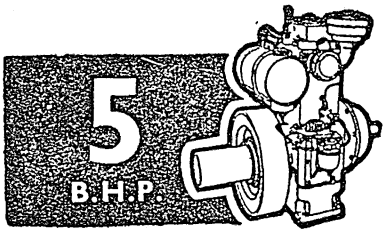
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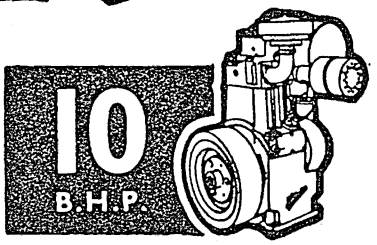
EVEREST



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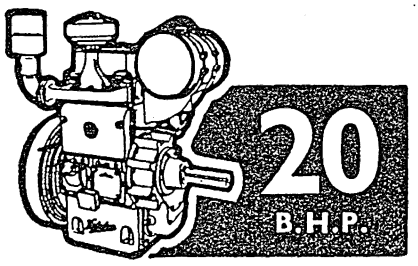
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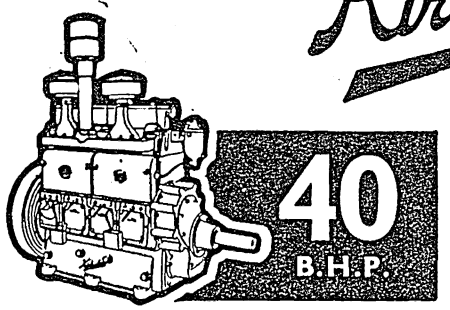
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Research Note

Better Implements For Farmers

With a view to effecting improvements in indigenous agricultural implements, a survey was sponsored by the Indian Council of Agricultural Research in 1954, and as many as 552 implements collected from various parts of the country tested at the Indian Agricultural Research Institute, New Delhi. These included: 192 ploughs, 87 harrows, 83 hoes, a 100 seed-drills, 14 planks and levellers, 40 rollers, 11 ridgers and 25 sickles. Simultaneously, efforts have also been made to introduce suitable implements from other countries, and to develop new machines.

The survey revealed that a wide variety of ploughs was used in the country, because the farmers made modifications in the shape and design of the plough to suit their own conditions of cultivation. As regards the harrows, their number was found to be very large in the former Hyderabad and Bombay States only. Similar was the case with hoes and seed-drills. The variation in seed-drills was particularly large in Madhya Pradesh. Sickles, levellers, rollers and ridgers did not differ much.

JAPANESE IMPLEMENTS

In 1950-51, a set of improved Japanese implements and machines was obtained from Japan. Of these, the pedal-operated paddy thresher and the rice-land weeder have been found very useful and are being used by farmers in several parts of the country. Various manufacturers have taken up their manufacture with certain modifications to suit our conditions. The Japanese weeder has been very considerably modified at the Agricultural Research Station, Karjat, and the new model has been given out on a very extensive scale through the Bombay Department of Agriculture.

Of the indigenous implements surveyed and the imported ones, the following have been found very suitable for adoption by farmers:

For paddy	Rice-land weeder
	Wet-land puddler
	Duck-foot Orissa plough
	Pedal-operated paddy thresher
For wheat	"Olpad" thresher
	Guntaka (hoe)
	Power thresher (Punjab thresher)
	Bund former
For cotton	Cotton seed-drill
For processing	Hand-operated paddy sheller
	Rice huller
	Rice polisher
	Groundnut decorticator

The drawings of these implements are supplied by the Division of Agricultural Engineering of the Institute to various concerns for their manufacture on a large scale.

MORE FROM ABROAD

Another 46 types of implements used in the U.S.A. and various European countries, and which are superior to our indigenous implements in certain respects, have recently been received through the FAO and their testing is in progress. They are:

Ploughs	4
Cultivators	20
Fork	1
Spades	2
Pulverizers	2
Seeders	2
Fertilizer placement machine	1
Mower	1
Scythes and attachments	8
Groundnut decorticator	1
Maize sheller	1
Chaff cutter	1
Hammers	2

Most of the implements and machines collected from within the country and imported from abroad are now on display in the Agricultural Museum of the Institute for the benefit of visiting farmers. All the required information pertaining to these implements is made available to interested parties on request.

NEW MACHINES

Research on the development of new machines was taken in hand in 1952. Machines which have already been developed are: rotary compost or manure screen, groundnut decorticator, jute seed-drill, groundnut planter and winnowing fan.

The blueprints of these machines have been supplied to various concerns so that they can manufacture them on a large scale. Besides, development work on the various implements which are likely to be of use to farmers is in progress. The implements being tested and developed are: improved *argadha* seed-drill, fertilizer placement-*cum*-sowing machine, bullock-operated seed-drill, standardized mould-board ploughs, bullock gear, single-bullock hitch, appliances and devices for using cow-dung gas and a small H.P. engine for use with cow-dung gas.

LET OUR INFORMATION SERVICE SOLVE YOUR PROBLEMS

The Publications Division of the Indian Council of Agricultural Research has issued a large number of publications for the benefit of farmers. These publications contain information on a wide variety of agricultural subjects and are being utilized by the agriculturists. Why not you too obtain copies?

Here are a few titles of the Farm Bulletins in English available with us :

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Tapioca Cultivation in India	25	The Jackfruit in India	25
The *Ber* in India	25	Breeds of Cattle in India	50
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Fish Culture in India	1.00	*Aonla,* Mulberry and *Karonda* in India	25
The Breadfruit in India	25	Mixed Farming in India	25
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NEW DELHI—2

The work on these implements is in an advanced stage. The development of a small H.P. engine for use with a gas plant to run on cowdung gas will be a great advance on the work so far conducted anywhere. The preliminary research shows much promise. Some of these projects are of fundamental nature, such as standardization of mouldboard ploughs. They require the study of mechanics of the soil and the geometry of the mouldboards to fabricate mouldboard ploughs for soils containing different amounts of clay and sand as their physical constituents.

In India, the use of fertilizers is becoming very popular. Most farmers broadcast the fertilizer and do not "place" it properly in the vicinity of the seed for maximum advantage. For this purpose, a fertilizer placement-*cum*-sowing machine is being developed. Various models of this machine are available in foreign countries, but their cost is very high and they require a large amount of power. It is, therefore, essential to develop a simpler but very effective machine to suit Indian conditions.

The implements of which the manufacture has been taken up on a very large scale in the country are: fodder-cutters, seed-drills, cane-crushing mills, mould-board ploughs, iron Persian wheel with a system of ball-bearings, " Olpad " thresher, the Japanese weeder, *triphali* (three-tined hoe), and hand-winnowers.

Under the Second Five Year Plan, implement stores and workshops are being set up in all the Development Blocks where improved implements would be stocked and repaired. The farmers have already started taking advantage of them. As time elapses, more and more of these facilities will be available to the farmers of the country.

CONTD. FROM PAGE 23

THE FARMER'S POINT OF VIEW

irrigation is done. It should be placed near the roots of the plants where canal or tubewell irrigation is available, taking care that the fertilizer does not fall on the leaves. The fertilizer should be mixed with an equal quantity of earth ; it would be ideal if earth constantly trodden by cattle in the barn is obtained.

The crop has also to be saved from pests and diseases. The spotted bollworm, the leaf-roller and the pink bollworm can be controlled by dusting the crop with five per cent BHC, and *tela* by spraying DDT one *chhatak* in 1½ maunds of water.

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What

SOIL CONSERVATION EDUCATION

Should Aim At

by

John Blackmore

Land Use and Conservation Specialist
Agriculture Division of the FAO

THE great clouds of dust blowing East from Texas or Colorado wheat fields, the network of gullies that devour farms in India, the masses of soil materials torn loose by pounding rains on overgrazed range lands in Yugoslavia or Africa. These are in large part the work of man—of rural man.

Over a very large part of the earth's surface where man lives, erosion problems are serious. Why do rural people permit this erosion which destroys the very foundation of their lives ? Why do so many people, in spite of the educational and technical efforts of their governments, take no action to control the erosion of their soils ? Why are the human problems in soil conservation proving to be so formidable ?

Ignorance is a basic problem. It is, unfortunately, possible for people to live on an eroding landscape and be almost unaware of it. Even very heavy rates of soil loss are sometimes accepted as a normal background for daily living. It is sometimes the case that rural people are aware of the erosion, but accept it as inevitable, worrying about it but not knowing what practical steps to take to control it. In these uncomplicated situations the role of the technician/educator is quite clear. It is to bring awareness of the problem and its significance and to teach techniques of erosion control.

Only a few erosion problems are so simple as this, yet many educational programmes seem to have assumed this sort of simplicity. A great deal of the educational efforts that have been made at soil conservation seem to be based on the idea that if rural people knew the techniques for erosion control they would apply them. Experience in many places suggests that technical knowledge is not enough. Some people have put into practice the new knowledge brought to them, others have continued to live as before with erosion unabated.

DIFFICULT PROBLEM

Many conservationists now recognize that their most difficult problem is the rural man who is aware of the erosion of his land, has access to technical information on erosion control, but still does nothing about his problem. The conservationist must equip himself not only with technical knowledge of soil management, he must also know some of the fundamental aspects of human behaviour.

Rural man, like other men, uses a chain of ends and means. Most things of importance to man are ends, or objectives in themselves, and in addition are also means for attaining still other ends. A farmer wants a larger harvest. This, in turn, makes possible a desired income which is a means by which still other desires are satisfied. People place higher values on some things as ends than they do on others. Unfortunately, the conservation of the soil is not often a very important end for many rural people. Disagreeable as this may be to conservationists, it must be recognized. Moreover, if we are to succeed with soil conservation, we must begin by accepting the framework of means and ends of land-using people as our starting point. We must begin with things of real concern to rural man. One of these, of universal importance, is the matter of providing a living. Altogether too many people in this world are still at the very edge of chronic hunger, still more people may have almost enough to eat, but lack nearly all the amenities of life such as decent housing, clothing, medical care and education. Where these are the major ends sought by rural people, soil

conservation cannot successfully compete for scarce means. It must itself prove to be a means to the more desired ends.

MOST SUCCESSFUL

In practical terms this means that the set of land-use practices recommended for soil conservation must not result in a diminished production for use or for sale, but preferably should give an expansion of such output. It is for this reason that the use of fertilizers is often a most successful soil conservation practice. It is for this reason too that land users will first devote their energies and scarce capital to the development of their most productive lands, leaving for the last the control of erosion on badly mutilated and potentially least productive sites. Rural man tends to be less concerned with the conservation needs of his land than with the basic human needs of his family. He will provide for the needs of his land when by doing so he can attain a more ultimate personal objective.

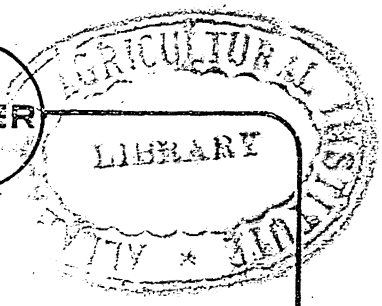
There are many cases, as for example in the catchment areas of important streams, where soil erosion is not controlled because the private objectives of land users and the objectives of the society or community are in conflict. The society may seek to control soil erosion because of its bad effects in terms of the behaviour of the stream such as flooding and siltation. On the other hand, the land users on the water-shed may feel that erosion control would involve private costs to them, not offset by any benefits. It is in such cases that the society must use subsidies. Subsidies are effective where their total costs are less than their benefits to the society and where they offset the sacrifices which individuals make in the public interest. Among the subsidies commonly used in soil conservation work are expenditures on research to find acceptable and effective means for erosion control, and payments for certain types of necessary installations such as gully control devices, establishment of grass seedings, forest plantations, or terracing.

NECESSARY COUNTERPART

A subsidy is not an alternative to education but it is sometimes a necessary counterpart to education. In situations where the private objectives of land users diverge from the soil conservation objectives of the society, a subsidy may be necessary to bring them together. A subsidy of some sort may give the individual land user the necessary incentive to seek new technological information useful in revising his system of land management.

The management process itself is the framework into which soil conservation education must be fitted. At the heart of the management process is the matter of decision making. Man is a decision maker. Important

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executives of government and of large business firms make decisions. Illiterate peasants make decisions too, and the decisions about land use that are made by millions of rural people in the course of their daily lives are the really strategic ones so far as soil conservation is concerned. The little decisions as to what crops to plant, which way the rows should run, how long animals should be left to graze and how many and what kind of animals should be kept—these are the decisions that determine whether soils will be conserved or wasted. Thus soil conservation education must encompass the acts of daily life of rural people. It cannot be a thing separate and apart.

Educational activities can be helpful in several ways in connection with the management of land. In the first place, it is often necessary to provide, through education, a basis for decision that traditional land-use practices could possibly be improved or superseded. Such a decision requires new knowledge of the improved land-management techniques and of their probable consequences. It should be emphasized that land users will decide to abandon old practices in favour of new ones only in the face of convincing evidence that by making the change some desired result is to be obtained. A decision on a change in land-use also involves consideration of a number of alternate possible actions. For example, it is not enough that a decision be made to use fertilizers on pasture lands ; decisions must be made as to what kind to use and as to the rate of application. Still other decisions are involved regarding time and method of application. Moreover, the decisions must be tailored to the particular situation on each farm.

RATIONAL LAND USE

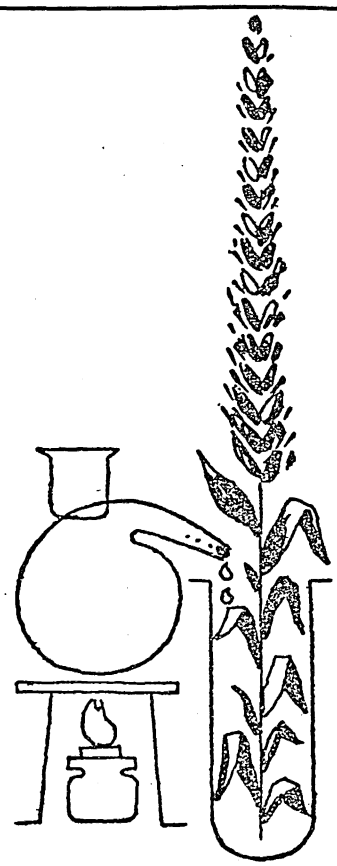
The subtle differences between farms that influence land-use decisions pose a formidable problem for soil conservationists. Effective soil conservation education must include more than a set of universally applicable "prescriptions" as to land-use practices. At the same time, glacially slow progress is made by using the available soil conservationists to make land-use plans on a farm-by-farm basis. No country can look forward to having a staff of conservationists sufficiently large that every land user has a specialist standing at his elbow prescribing the details of every action to be taken. A main part of the conservation education job is to teach methods of rational land-use planning and, in addition, to provide technical information in a form that facilitates

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the making of the particular land-use decisions that confront individual farmers.

The fragmentation of farms through inheritance or otherwise is a formidable barrier to the adoption of conservation farming methods. There are millions of fragmented farms scattered from Lisbon to Manila. The teaching of methods for their consolidation is a necessary part of the conservation education work.

OTHER FUNCTIONS

Conservation education has other functions related to problems of rural man. Over much of the world, cultivators, by reason of their tenure on the land, have no incentive to invest their labour or capital in the future productivity of the soil. Contractual relations of tenants with their landlords are often such that the benefits of tenants' investments go only to the land-owners and not to those who work the land. In other cases, the tenants' share of the production is only enough to provide for the most basic human needs, leaving nothing as savings for re-investment in the maintenance of the land's productivity. It is not uncommon also to find that customary tenure relationships are such that land-owners are reluctant to make such investments, feeling that the risks are too great. All around the world, an important part of the conservation education job is to teach both land-owners and cultivators methods for developing and using improved land tenure systems that provide incentives for both to make investments in land improvement.

Effective programmes of conservation education should serve more than rural man. In many countries important land-use decisions are made by absentee land-owners and often these are urban people. In addition, effective programmes should not overlook school-age children. School programmes should include instruction in technical skills and should also be directed to influencing basic attitudes on the conservation of the soil.

TWO OBJECTIVES

Soil conservation education for rural man should have these two objectives: to stimulate a desire for change in land-management practices, and to teach practical processes for planning land-use. For attaining these twin objectives, two educational devices have proved singularly effective when used with a system of farm advisors. One is the demonstration farm, and the other is the community organization. Used together, these make an effective educational combination. Practical, farmer-operated demonstration farms provide local experience with innovations in land management and other production practices. They have the dual advantage of providing observable results and of demonstrating the practicality of particular innovations when used as part of a whole-farm operation system. From such farms neighbouring farmers can learn not only how to install a system of terraces, but also how such a system fits in with such other farm practices as land tillage and crop harvesting. Probably even more important, neighbours can observe the economic consequences of the adoption of such innovations in terms of improved family living. Wives who see home improvements on demonstration farms become strong and effective advocates of systems of conservation farming.

COMMUNITY GROUPS

The first social grouping of rural people, above the family, is the neighbourhood or community group. Such groups are formed and held together by some common set of interests. In many cases, the joint problems of erosion and water control are a basis for group action at this level. The design of a system for disposing of surplus water from several farms, the consolidation of fragmented holdings, the stabilization of large gullies, the regulation of grazing on commonly held pasture lands, all these matters provide a base for group action. Conservation education on these problems can be made a main pillar in programmes of village, neighbourhood, or community action.

A community organization is a means for stimulating and mobilizing the local energy, and for magnifying the effectiveness of technical advisors. Demonstration farms can show what can be done, community organization provides the means for its accomplishments. The establishment of community goals for soil conservation, the designation of project committees for particular practices such as pasture establishment, terracing, fertilizer use, organization of training classes and farm tours, and some friendly competition between developing communities are all useful means for education in soil conservation.

Conservation education must bring more than technical information. It must bring to rural man new ideas on planning land use. It must also bring some stimulation of such primary social groupings as the community to serve as means for focussing the energies of rural people on their soil conservation problems. Conservation education must set out to widen rural man's range of choices as to land-use practices, and thus through his everyday decisions about land-use achieve an improved and permanent productivity of the soils upon which we all depend.

READERS WRITE

Silver From Sisal

The above article in the June, 1958 issue of "Indian Farming" gave me some valuable information on sisal. At present, I am cultivating sisal only as a fence for my mango grove. As a vast area of my land seems to suit sisal, I request you to kindly furnish me with full details about its cultivation and marketing.

—P. C. P. Radhakrishnan,
T. Palayam, Madalapet P. O.

The method of planting sisal (*Agave sisalana*) varies considerably according to conditions of soil and climate. In East Africa (Kenya and Tanganyika), sisal is cultivated on a large scale. It has been cultivated on an experimental scale in Assam, Bengal, Madras, Bombay and Mysore. It grows well in dry zones on well-drained soils, and is exceedingly drought-resistant.

There are two practical methods of propagating the plant : by bulbils and from suckers.

Bulbils are produced when the plant, after vegetating for a certain period (about ten years in India), makes the supreme reproductive effort which results in its death. The terminal bud from the centre of the plant begins to grow rapidly, forming a long flowering stem out of which emerge the lateral branches producing flowers in dense clusters. Before long, buds appear in the axils of the scale leaves just below the flowers, which rapidly wither away. From these buds arise small plants, known as bulbils, which grow a few inches in length, get detached and fall on the ground, where some of them take root. For cultivation, these bulbils are removed and planted, preferably in nurseries. About 2,000 bulbils are produced by one flowering stem.

After producing bulbils the whole plant withers up and dies. Suckers attached to the main plant at this time may throw out a central stalk to a height of three or four feet bearing diminutive flowers and bulbils. They will invariably do so if the pole of the parent plant is removed at an early stage. This stage in the life of the sisal plant—the "poling stage"—and the time of its occurrence are a matter of great concern to the practical planter, as upon it largely depends the arrangement of his planting programme. It may also prove a determining factor in respect of crop-yield, but the rate of leaf production must not be overlooked in this connection.

Suckers are produced from underground stems or rhizomes, which may be of some length, and thus new plants arise near the parent plant. Suckers constantly appear after the first year and develop in clusters round the parent plant.

Suckers are said to reach maturity about a year earlier than bulbils, but they also "pole" earlier. On the whole, plants raised from bulbils make better progress than those from suckers. Bulbils are more easily obtainable in large quantities. For this reason, they are frequently used for starting plantations.

According to some authors, bulbils are more dependable than suckers for obtaining new plants exactly similar to the parent plants. Previous to planting out in the field, the bulbils should be kept in nurseries for about one year, spaced out nine inches × 18 inches, to obtain optimum-size stock for planting.

Transplanting is easily and quickly done into small holes prepared in advance. Care is taken that the bulb is no more than partly covered with earth. Regarding spacing, there is much difference in opinion. Generally, the plants are planted six feet apart in eight feet apart rows, which gives 908 plants per acre. However, the spacing would depend on the fertility of the site. A closer spacing should be adopted on poorer sites.

Weed removal and soil-working are essential throughout the life of the plantation. These not only facilitate the cutting operations but make for very good growth and development of plants. All suckers developing during the first two years may be removed. Sisal should preferably be grown as a pure plantation, but cotton or other similar catch crops may be taken in the first few years.

The harvesting of leaves from the plant for fibre commences in the third or fourth year. The leaves extend laterally at right angles to the trunk, and the older ones are cut close to the trunk. The cutting of mature leaves should not be unduly delayed, or the quality and quantity of fibre would suffer.

Biannual cutting (January to September) of each plant should give an average 250 to 300 leaves during its lifetime of seven to eight years. The average weight of the sisal leaf is about two pounds, and a 1,000 leaves yield 60 to 80 pounds of dry fibre. Although the fibre content is as high as six to eight per cent, only three to four per cent is obtained by decortication.

Cateful planning is needed for the extraction of the fibre. The harvested leaves should be extracted immediately (within 24 hours). In East Africa, this is usually done by mechanical decorticators. In India, the leaves are either scraped by hand to remove the green matter from the fibrous layer or they are passed through a cane-crushing mill and then retted in water. The fibre becomes marketable after washing, drying, crushing and finally grading.

No Reason Why Ratoon Should Be Neglected

by

Kumar Nath Singh

Zonal Centre, Pachrukhi
Sugarcane Research Institute
Pusa

THE ratoon crop of sugarcane can yield as well as the plant crop, if given proper care. In three consecutive trials in Saran district of Bihar, I found that it yielded even better—by 23 per cent.

A one-fourth acre of land was selected and green manuring done with *sanai*. After a month of sowing *sanai*, a watch was kept over the formation of nodules by uprooting clumps at random once a week. It generally took 50 to 70 days for the maximum formation of nodules, when the crop was turned down with a soil-turning plough ; five maunds of green-leaf compost was applied at the time of ploughing in the *sanai*. Then, by the last week of September or the first week of October, the plot was thoroughly ploughed twice and *hengaed* well.

After the seed-bed was ready for planting, the furrows were opened, manure (castor cake one maund ten seers plus single superphosphate 20 seers) applied in the furrows and mixed well with a subsoiler. Then, healthy three-budded cane-setts from mother stalks only were planted. The setts were covered with a four-tined cultivator which was put through the furrows and finally *hengaed* twice. After a week, one more *henga* was given. One interculture in November, one in January and one in February were given to the crop. Towards the last week of March, one irrigation was given and again intercultivation done after a week. Towards the last week of April, the crop was irrigated for the second time and intercultured once again after a week. Then, by mid-May or May-end, the crop was earthed, and ten seers of ammonium sulphate applied. Finally, a furrow irrigation was given.

The plant cane was harvested during the second half of November. All mature millable canes were cut fairly close to the soil. Young post-monsoon tillers emerging from September onwards were left in the field for the second crop year, as these do not reach maturity at the time of the harvest of plant cane and thus bring the recovery down.

After the harvesting of the plant cane was complete, the soil of the ridge was stirred well with a *khurpa* to help aeration and extermination of weeds that grew between the plants. Also, hoeing was done with a spade.

PREMONSOON IRRIGATION

After the first hoeing of the ratoon cane, well-rotted manure (cattle dung plus 35 seers of castor cake plus farm waste previously well-decomposed in a pit) was supplied with five seers of single superphosphate (at ½ maund to the acre) just near the plant roots. Both sides of the plant rows were carefully opened sufficiently deep by spade so as to make room for the manure. Then one irrigation was given. All these operations were completed by December.

The second hoeing was done between the last week of January and the first week of February. By the middle of February, one deep intercultivation was done, and between the end of February and early March, when the crop was one foot to two feet high, a dose of one maund and ten seers of castor cake (at five maunds to the acre) plus single superphosphate 15 seers (at 1½ maunds to the acre) plus ammonium sulphate ten seers (at one maund to the acre) was applied. Then the crop was lightly earthed for the first time. Irrigation was given once again and two deep interculturings were done in furrows. By mid-April, one furrow irrigation was given with a deep intercultivation after a week's interval.

In mid-May, ten seers of ammonium sulphate (at one maund to the acre) were applied. Finally, the crop was earthed and irrigated for the last time.

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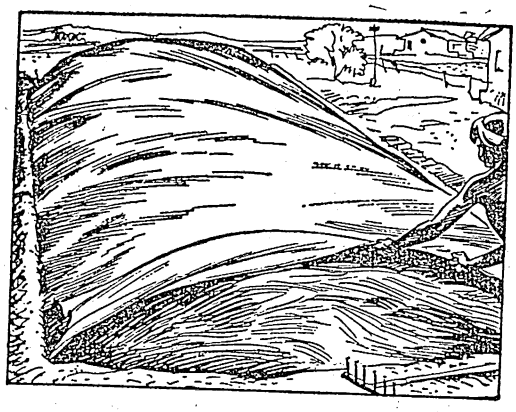
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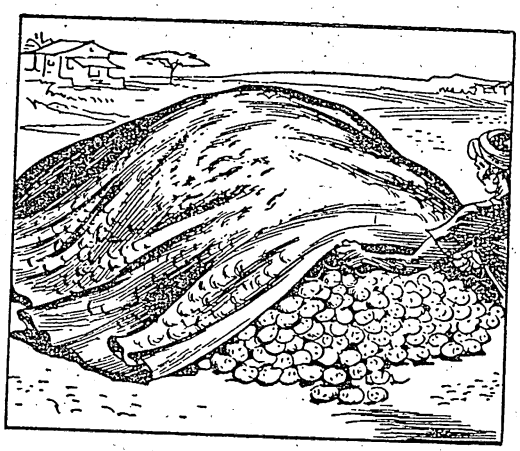
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In the month of October, the ratoon crop was ready for harvest. After the harvest of the ratoon crop, the field was given a deep ploughing and left fallow.

MANY ADVANTAGES

The ratoon plays an important role in the economy of sugarcane cultivation. It has the following advantages: (i) The expenditure on preparatory tillage, seed cane and planting is quite high for plant cane, but it can be reduced by distributing it over the plant and ratoon crops. (ii) There is no expenditure except on manures, interculturing and irrigation. (iii) More income is obtained from the same field. (iv) Valuable time during the busy planting season is saved. (v) The crushing period is prolonged and the sugar recovery is higher, if milled earlier. (vi) Having a ratoon rather than other cash crops after plant cane is always better.

Here are a few tips for getting a good ratoon crop:

Give proper attention to the plant cane which is intended to be ratooned, because gappy, poorly grown and diseased plants can never give a ratoon worth the name.

Select the seed cane carefully. The cane variety is the first thing to consider before planting for ratoon. While all varieties are not by character suitable for ratooning, some are heavy ratooners. Personally, I prefer *Co.513*, *B.O.22* and *B.O.29*. The seed cane must be healthy, mature and disease-free. If possible, only mother stalks should be used for seed purposes. Generally, 4,000 stalks are required for planting an acre and may easily be had from one-fourth acre of standing cane.

Just after the harvest of the plant cane, there is an acute shortage of soil moisture. So, a premonsoon irrigation is necessary for the ratoon crop.

Apply sufficient organic as well as inorganic manures, i.e., green manure (*sanai*), castor cake and green-leaf compost and ammonium sulphate and single superphosphate.

I prepared the green-leaf compost this way. Useless green leafy plants (*kalmidal*, etc.) found floating on the surface of many village tanks and ponds were collected. Green *neem* and *tulsi* leaves were added with a view to keeping insect pests away. *Shiso* leaves, *kalmidal*, castor leaves and mustard leaves, all in green condition, were put in the compost pit in alternate layers with cattle dung, ash and farm wastes. The compost thus got was applied at 20 maunds to the acre at the time of ploughing in the green manure crop. *Neem* leaves have germicidal and antiseptic effects. So, it may be wise to add some green leaves every year to the field at the time of cultivation or ploughing in of the green manure crop in the monsoon.

CONTD. FROM PAGE 16

Farming Elsewhere

potatoes and potatoes for industrial processing, sugar-beet, fodder-beet, pulse crops (chiefly green peas), flax and rapeseed.

Thanks to intensive tillage, a favourable climate, efficient water management and thorough fertilization, the yields obtained are among the highest in the world. In 1957, the average per-hectare harvests for the whole country were: wheat 3,967 kilograms (a kilogram=2.2 pounds); rye 2,911 kilograms; barley 4,043 kilograms; oats 3,177 kilograms; potatoes 28,000 kilograms; and sugar-beet 42,000 kilograms.

Typical of Holland are the plant selection and breeding establishments, which supply a number of countries with seed grains, seed peas and beans, field crop seeds and seed potatoes.

The total area of grassland is 1,300,000 hectares, or 56 per cent of the available cultivable land. Part of the remaining 44 per cent is moreover utilized for the production of animal fodder and for poultry farming, so that about two-thirds of the cultivable land in Holland is directly or indirectly in the service of stock-breeding.

The grassland is distributed over the whole of Holland, with heavy concentrations in the fen peat region and the districts along the large rivers.

LARGE CATTLE POPULATION

The cattle population density is nearly 2.5 units per hectare, which is very high for a country in which hay has to be gathered during the summer for use in winter when the animals are stalled. The high density of the cattle population gives rise, on the one hand, to the necessity for increasing the production of grass by abundant fertilization and, on the other hand, to the large-scale consumption of supplementary feeding-stuffs. Since not all the required feeding-stuffs can be grown in Holland, large quantities of fodder grains are imported, not only for cattle but also for pigs and poultry. Stock-breeding in Holland might, therefore, be compared to a single great upgrading industry which imports raw materials and exports valuable end-products (milk, butter, cheese, meat and eggs).

Holland's milk production in 1957 was just over 5,827,000,000 litres (1,280,000,000 Imp. gal.) and the yield per cow 3,947 litres (868 Imp. gal.)—the highest in the world. The butterfat content of the milk, which has increased practically every year, is at present in the region of 3.75 per cent.

The large milk production and the high butterfat content are primarily the result of efficient selection of the breeding stock. There are two cattle herdbooks—one of which embraces three breeds—in which only the

best pedigree animals are registered. Only the very finest bulls may be used for breeding; they are frequently owned by the artificial insemination co-operatives.

Thanks to co-operation between the farmers and the Government the national herd is entirely free from tuberculosis and the foot-and-mouth disease.

Although in Holland cattle are kept mainly with a view to milk production, some 200,000 tons of meat are nevertheless produced every year.

The pigs kept in Holland belong mainly to two breeds, one of which provides export bacon and the other, meat for home consumption. The total production is about 350,000 tons per year.

The number of horses is decreasing year by year owing to the mechanization of agriculture. On the 294,000 farms, however, there are still 200,000 horses and foals, including some very fine pedigree animals.

Sheep are kept for the meat they provide; the sale of wool is merely a sideline.

Poultry farming has increased enormously. There are special hatcheries in which hundreds of thousands of eggs from selected birds are hatched every year. The young hens and the older ones together lay approximately 5,000 million eggs per year. The average yield per bird is 200 eggs annually. Ducks are kept both for egg production and for slaughter.

HORTICULTURE

Nearly 125,000 hectares of cultivable land (five per cent of the total) are in the service of Dutch horticulture.

Vegetable-growing is the most important branch; 47,000 hectares, of which 3,400 are under glass, are utilized for this purpose. The most widely grown crops, both for the home market and for export, are cabbage, lettuce, onions, tomatoes, carrots, runner-beans, French beans, gherkins, cauliflower, red and white cabbage, Brussels sprouts and asparagus. Most of the vegetables are grown in places where there is a great deal of peat in the ground, that is to say in the west of the country and the districts in which the low moor peat has been dug away. Recently, however, vegetables have also been grown in large quantities on the light marine-clay soils (clay with sand). The annual production for the market is over a million tons.

Fruit-growing is pursued mainly on the river-clay and marine-clay soils, but strawberries, red and black currants and raspberries are also cultivated on light sandy and peaty soils. The total area available is 60,000 hectares, of which 700 are under glass. The annual production for the market is between 350,000 and 400,000 tons; it consists chiefly of apples, pears, grapes red and black currants, cherries, plums and strawberries

The bulb-growing industry is concentrated mainly on the strip of light sandy soil behind the dunes. Every spring, the flowering bulbfields in this district are visited by hundreds of thousands of tourists. Only a small acreage (less than 9,000 hectares) is utilized for the cultivation of bulbs, but the yield has a high value. This value is expressed not only in terms of money but also in the fame that Holland has acquired through its bulbs.

Dutch cut-flowers and flowering plants can likewise be regarded as ambassadors of Holland. More than 500 million cut-flowers (mainly tulips, carnations, freesias and roses) and ten million potted plants are taken to the auctions every year. They are grown principally on the peat soil in the west of the country, the area in use for this purpose being 1,400 hectares, of which 450 are under glass.

Woody nursery stock is grown on the peat soil in the west of the country and on the sandy soil in the south and east. The area in use amounts to 2,700 hectares in the open and ten hectares under glass.

A further considerable acreage, totalling 5,500 hectares is utilized for the cultivation of fruit and vegetables for seed.

Dutch agricultural produce is for the most part distributed through markets, product exchanges and co-operative auction societies. Certain products (milk, sugar-beet, potatoes and straw) are also delivered direct to the processing factories.

The co-operative factories account for 70 per cent of industrial-milk processing, 80 per cent of potato-flour production, 65 per cent of sugar-beet processing, 65 per cent of strawboard production and 50 per cent of export bacon production.

For the sorting and storage of potatoes and fruit, numerous sorting establishments, storage depots and refrigerated warehouses have been built, some of which are run on a co-operative basis.

In 1957, Holland was the world's biggest exporter of potatoes (450,000 tons), potato flour (65,000 tons) eggs (2,700 million), bulbs (200 million guilders' worth; one Dutch guilder = £ 0.1.11) and strawboard (210,000 tons). In addition, Holland was the biggest exporter of condensed milk (230,000 tons), the second biggest of cheese (86,000 tons), the third biggest of powdered milk (36,000 tons), and the fourth biggest of butter (36,000 tons).

The strict control exercised by the Government over the quality of practically all agricultural export products sets a final seal on the work of the Dutch farmers, horticulturists and manufacturers.

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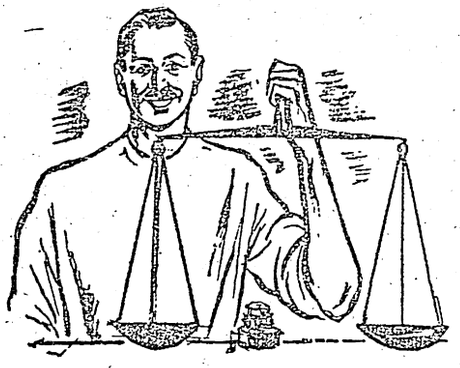
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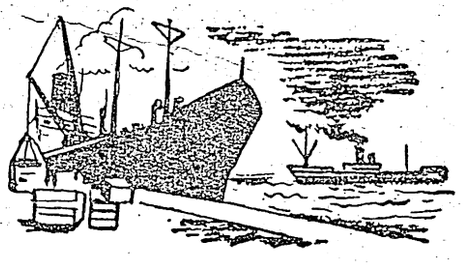
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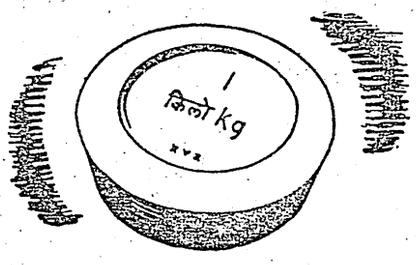


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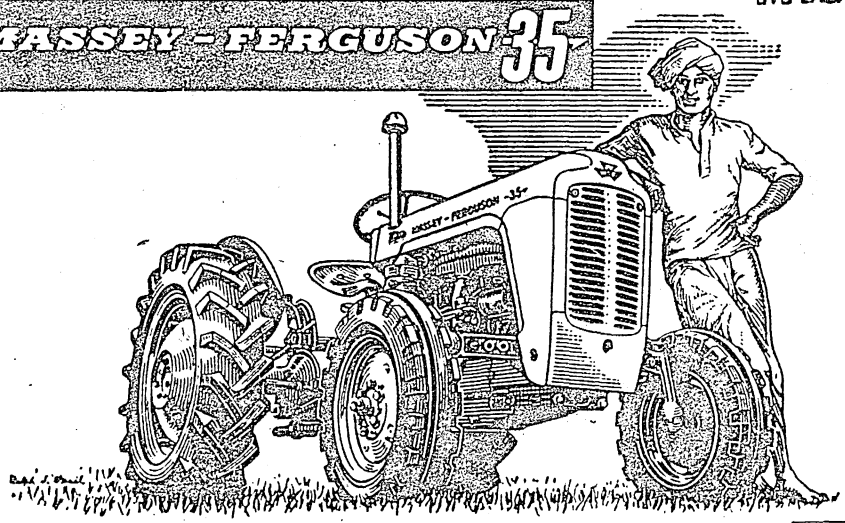
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